DEC 17 1928

Telephone Engineer

Assured Profitable Operation Over A Long Term Of Years

TELEPHONE companies are in business to make money. To do this, it is of the highest importance that their small exchanges, as well as their large ones, be operated on a profit-making—rather than a profit-less—basis. That small exchanges equipped for Strowger operation, *do* pay profits, instead of the opposite, is the main reason for their increasing adoption.

Other methods of operating small exchanges may be less in first cost, but Strowger Automatic will prove the more profitable over a long term of years. Other methods may not give rise to public criticism, but only Strowger operation is capable of paving the way for increased rates.

Strowger Automatic operation is the best for small exchanges not merely because it is automatic. It is best because it has been *proven* best by many companies from the actual records of their small automatic exchanges; the desired results being accomplished through the reduction of operating and maintenance expense and by the securing of adequate rates because of improved service.

Automatic Electric Inc.

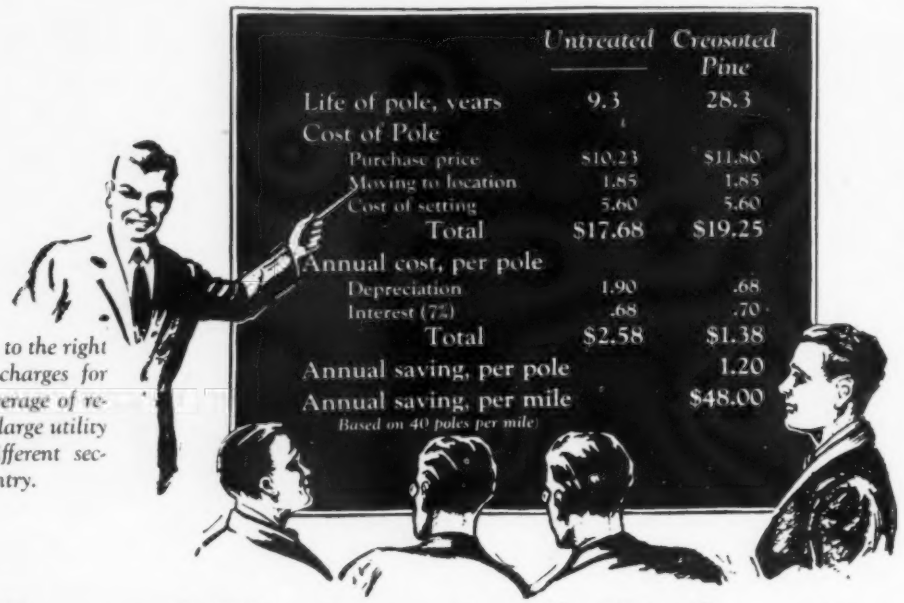
Factory and General Offices: 1033 West Van Buren St., Chicago, U. S. A.

Sales and Service Offices in All Principal Cities

EXPORT DISTRIBUTORS

For Australasia—Automatic Telephones, Ltd., Sydney
For Canada—Independent Sales and Engineering Co., Ltd., Vancouver
Elsewhere—The Automatic Electric Company, Ltd., Chicago.

STROWGER AUTOMATIC TELEPHONE EQUIPMENT



The figures given to the right are the annual charges for 6"-30' poles---average of reports from three large utility companies in different sections of the country.

"The Use of Untreated Poles is an Economic Waste -- an Unnecessary Burden on the Company and on . . . the Public"

THIS is a time of the year for checking up on past operations and laying plans for the future.

Give consideration to the economies which may be effected in the operation of your business by adopting the policy of specifying Creosoted Southern Yellow Pine for all pole replacements and construction of new lines.

Disinterested authorities conservatively estimate the minimum service life expectancy of properly-creosoted Pine poles at 35 years (many have been serving that long and are still sound and apparently good for years more), which is at least four, or more, times the life of untreated poles under average service conditions.

The proved, lower per-annum cost of properly-creosoted Pine poles, as opposed to untreated poles of any species commercially available, points the way to lower the outgo for maintenance, and increase net earnings.

Four Times As Costly As Treated Poles

Consider the cost of poles and setting, alone. One properly-creosoted Southern Yellow Pine Pole will serve without need for inspection, stubbing, or guying for at least 35 to 40 years. During this period of time only one pole and one installation cost are necessary. On the other hand, untreated poles must be replaced every eight to ten years. That means four poles and four separate installation costs, during the same length of time.

Save By Preventing Service Interruptions

When wind and sleet storms, or other severe stresses come, the decay-weakened, termite-eaten, untreated poles---the records of dozens of companies on thousands of poles show---are the ones that go down and cause the unnecessary service interruptions, with their resultant losses and high replacement costs.

¶ We would appreciate the opportunity to submit "Evidence" of the true economy of using "Black Beauty" Poles---and the relative value they offer per dollar of investment.

American Electric Company, Inc.

Distributors of "Black Beauty" Poles and Cross Arms to the Independent Telephone Trade.

State and 64th Streets : - : Chicago, Ill.

Branch Office and Warehouse: 622 Wyandotte St., Kansas City, Mo.

A PROVED GUARDIAN OF INVESTMENTS

"Black Beauty" Poles

TELEPHONE ENGINEER, December, 1928. Volume 32. No. 12. Published monthly by TELEPHONE ENGINEER. Publication Office, 192 N. Clark St., Chicago, Ill. Subscription price $2 a year in the U. S. Entered as second-class matter June 6, 1922, at the Post Office at Chicago, Ill., under act of March 3, 1879.

Matthews Scrulix Anchors are best for most anchorages, but *if you prefer a plate type anchor*—

Here's a Better One!

THE improvements and advantages of the new Matthews Traplox Anchor make it far and away the outstanding plate type anchor. It is superior. A trial will prove it to you.

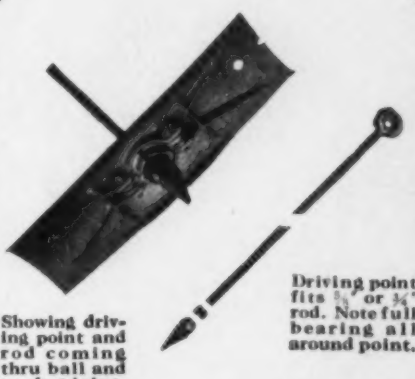
Among the many features that make the Traplox better are these:

Guy rods with either a rolled or cut thread may be used. A special driving point which requires only a few seconds to attach to the standard rod is supplied with each anchor. No special rods are necessary.

The rod and plate are attached to each other by means of a ball and socket joint, which causes the strain to be distributed throughout its periphery. This prevents the concentration of the entire stress at two points at the joint and eliminates the possibility of shearing the point and bending the plate.

W. N. MATTHEWS CORP.
Engineers and Manufacturers
3714 Forest Park Blvd.
St. Louis, U. S. A.
Offices in All Principal Cities

Your Electrical Wholesaler Can Supply You with Matthews Specialties



Showing driving point and rod coming thru ball and socket joint.

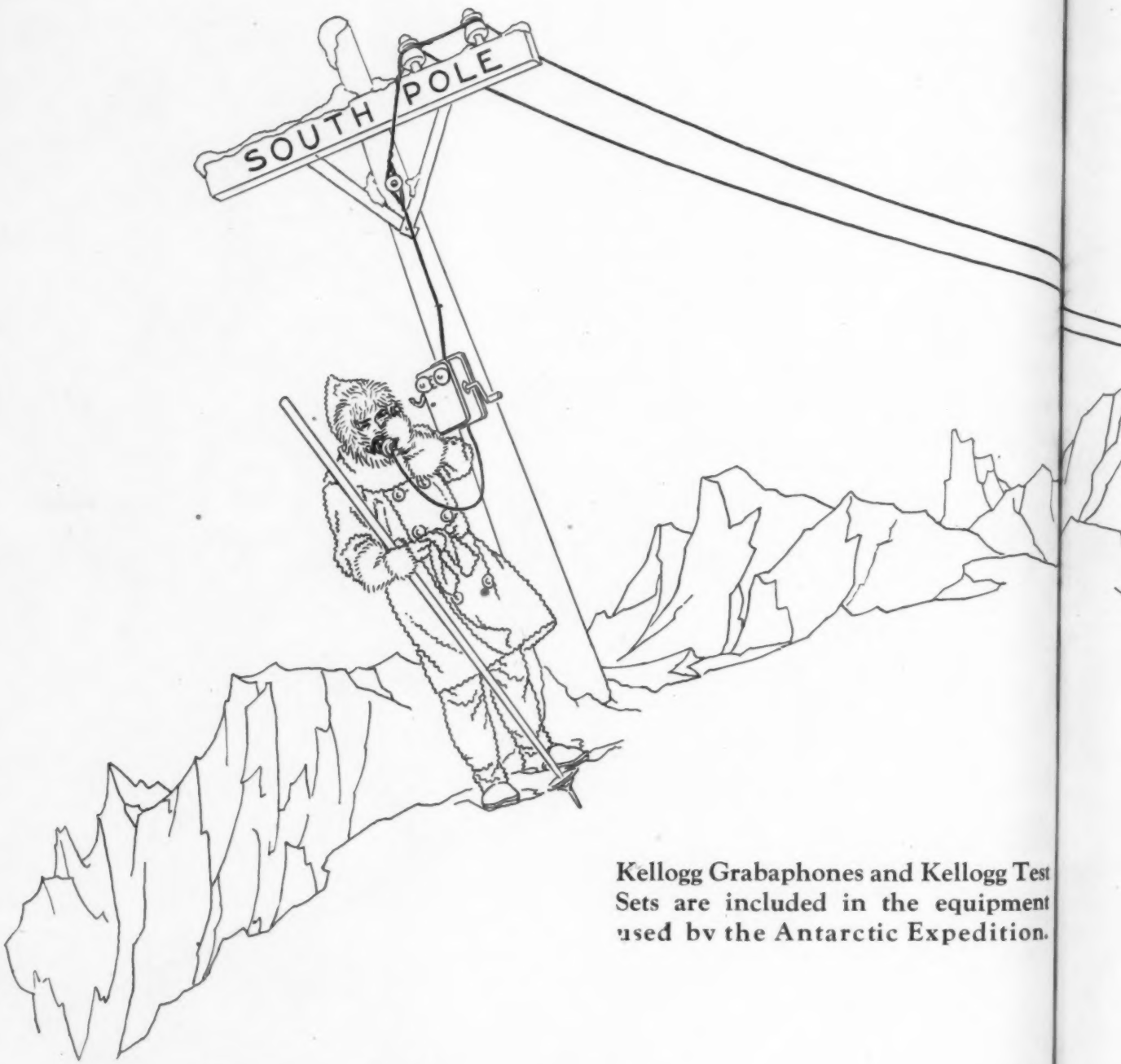
Driving point fits ⅝" or ¾" rod. Note full bearing all around point.

Made in 3 Sizes
No. 90 for use with 6,000 lb. guy strand.
No. 120 for use with 10,000 lb. guy strand in clay.
No. 160 for use with 10,000 lb. guy strand in loam or sandy ground.

MATTHEWS TRAPLOX ANCHORS

163

SOUTH POLE



Kellogg Grabaphones and Kellogg Test Sets are included in the equipment used by the Antarctic Expedition.

Kellogg Switchboard

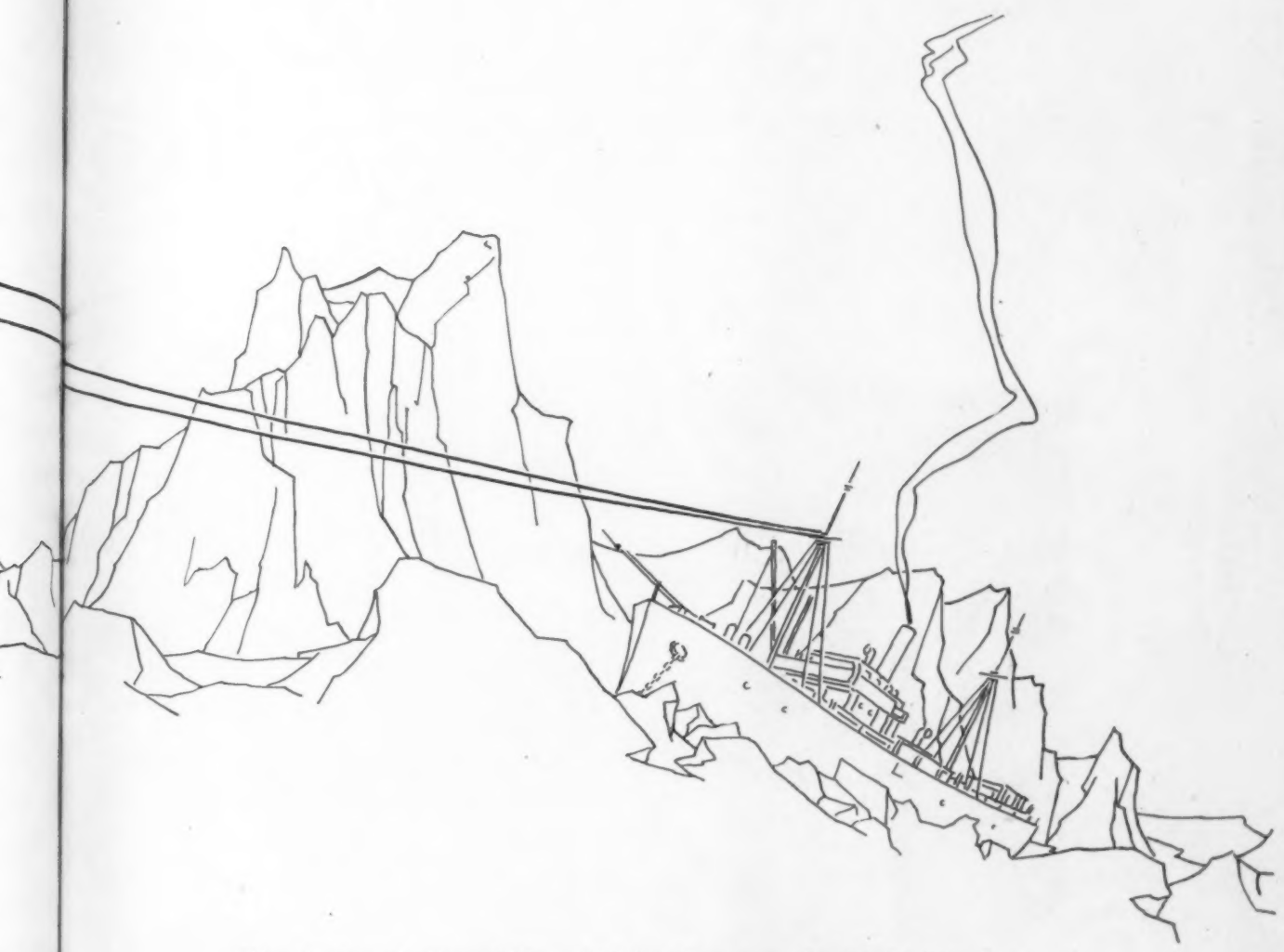
1020-70 West Adams Street, Chicago

Branch Offices and Warehouses:

COLUMBUS, OHIO
163 N. Fourth Street

KANSAS CITY, MISSOURI
308 W. 6th Street, Traffic 12 E. Seventh

GOES KELLOGG



The Antarctic Expedition led by Commander R. E. Byrd chose Kellogg Telephones to furnish reliable telephone communication at the South Pole. This decision was made after careful consideration of the extreme weather conditions and the hard usage to which their telephone equipment would be put.

arnd Supply **Company**

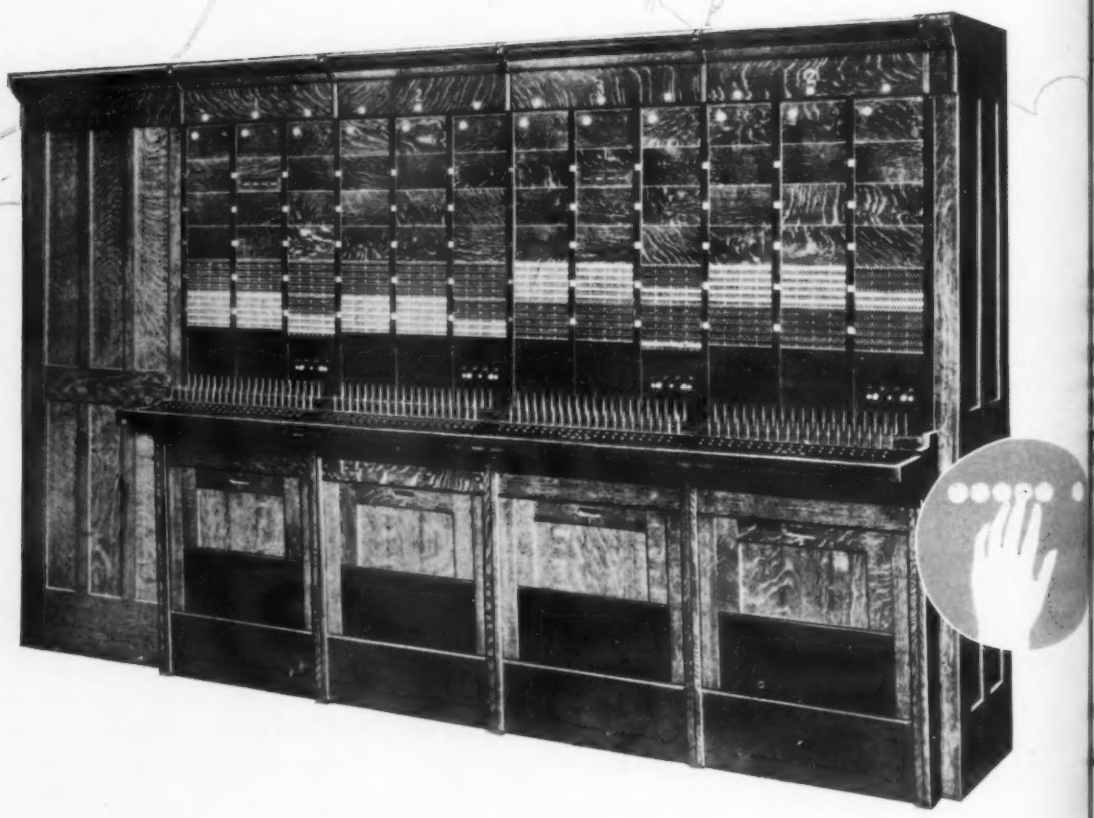
Ada eet, Chicago, Illinois

Branch Offices and Warehouses:

MISSO TLAND, OREGON
Traffic 2 E. Seventh Street

SAN FRANCISCO, CALIF.
1054 Mission Street

Lessens Cost



Stromberg-

t of Training

Every type of central exchange switchboard requires a certain number of operators. This, in turn, necessitates a training expense for each beginner.

But, when the Stromberg-Carlson Super-Service Switchboard is used, few operators are required, therefore, training expense is low. And, furthermore, this switchboard is so simple to operate, that it takes an astonishingly short time for the student operator to become proficient.

This is due, in a large part, to the modern keyboard used on the Stromberg-Carlson Super-Service Switchboard. Instead of a great number of keys, there are only four or five common to all cord circuits, which removes the necessity of the operator associating the correct cord and key. She can use the touch system, which is learned quickly and easily.

Let Stromberg-Carlson engineers prove to you that this is the most economical and efficient telephone switching apparatus on the market.

Features of the Stromberg-Carlson Super-Service Switchboard:

perator's Ringing Control
alling Subscriber's Ringing Control
perator's Listening Indication
ntantaneous Ringing Cut-Off
everting Busy Test with Tone
ntantaneous Ringing Start
perator's Secret Service
isual Ringing Indication

Features—Continued

Advance Plugging-In
Reverting Call Ringing
Audible Busy Test
Positive Supervision
Non-ring Signalling
Emergency Ringing
Operator's Cut-In
Machine Ringing
Flash Recall
Dark Keyboard
Operator's Bar
Ringing Tone
Call Registration

Write for Bulletin 117

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rnett, Young & Co.,
San Francisco, Cal.
Los Angeles, Cal.
Portland, Ore.
Seattle, Wash.

Stromberg-Carlson Telephone Mfg. Co.

Factory and General Offices:
ROCHESTER, N. Y., U. S. A.
Branch Offices:
CHICAGO, ILLINOIS KANSAS CITY, MISSOURI TORONTO, CANADA

Southern Representative
Scoville Mercantile Company,
Atlanta, Ga.

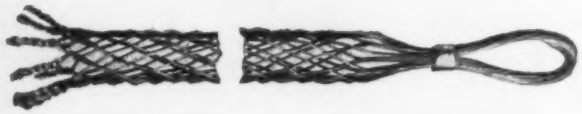
g~ Carlson

Reliable

New Specialties

Reliable

CABLE GRIPS



Aerial Cable Pulling Grips made longer than the old standards—do not catch in the rings—last longer.

No.	For Cable Diam. Inches	Length Over all	Weight Each
822	¾ to ⅞	40¾	7 oz.
823	1 to 1⅜	42½	½ lb.
824	1½ to 1⅞	43	¾ lb.
825	2 to 2⅜	43½	1½ lbs.
826	2½ to 2⅞	42½	1¾ lbs.

Underground Cable Pulling Grips of great strength and toughness—cast steel wires—two ply with brazed ends will outlast a dozen ordinary underground grips.

No.	For Cable Diam. Inches	Length Over all	Weight Each
806	2½ to 2⅞	56	2¾ lbs.
807	3 to 3⅜	53	3½ lbs.

Reliable

TESTING CLIPS

For piercing insulated wires.

Made of heavy nickel silver with hard sharp spikes —excellent workmanship.

Reliable

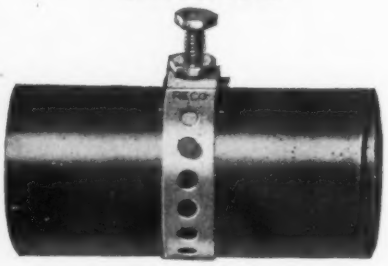
FIBRE TEST BOARDS

Numbers that you can read.
Numbers that will not wash off.
Standard numbering:

No. 810	1- 51	No. 822	607-657
No. 811	51-101	No. 823	657-707
No 812	102-152	No. 824	708-758
No. 813	152-202	No. 825	758-808
No. 814	203-253	No. 826	809-859
No. 815	253-303	No. 827	859-909
No. 816	304-354	No. 828	910-960
No. 817	354-404	No. 829	960-1010
No. 818	405-455	No. 830	1011-1061
No. 819	455-505	No. 831	1061-1111
No. 820	506-556	No. 832	1112-1162
No. 821	556-606	No. 833	1162-1212

Reliable

STATION GROUND CLAMPS



For telephone, radio and signal circuit station grounds.

Tinned copper strips—close fitting threads—excellent workmanship.

Reliable Electric Company

Mfgrs. of Telephone, Switchboard and Cable Protection

3145 Carroll Avenue **CHICAGO, ILLINOIS**

AMERICAN STEEL & WIRE COMPANY'S

PERFECTED

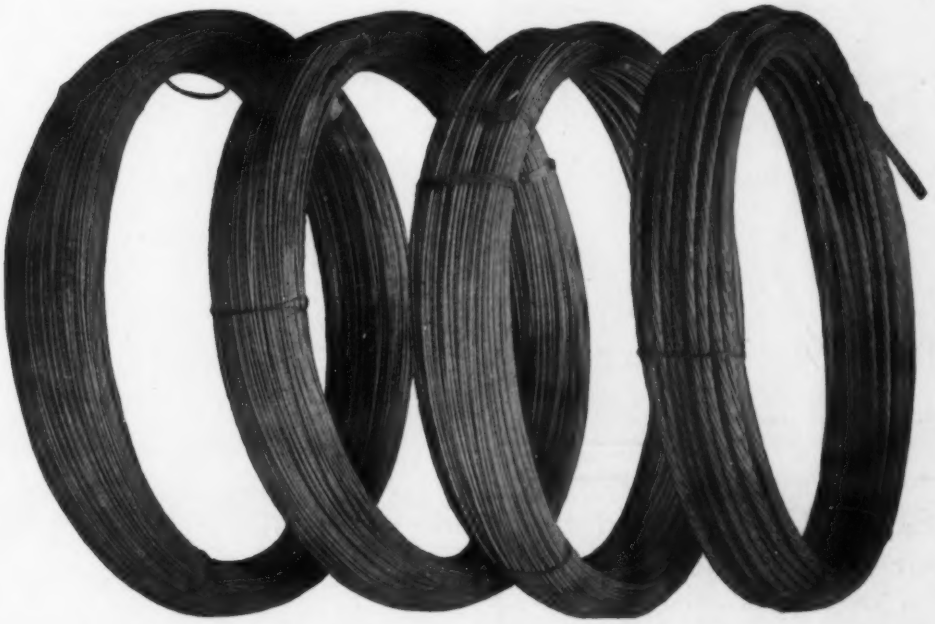
Telegraph and Telephone Wire

and

Perfected Strand

Made from only the best of materials and galvanized by our new process of tight zinc coating that is smooth, deeply laid and naturally flexible as the wire.

Produced in our old reliable standard brands "Extra BB" "BB" and "Steel"



AMERICAN STEEL AND WIRE COMPANY

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CLEVELAND ..... Rockefeller Building
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MINN'POLIS-ST. PAUL Merch. Natl. Bk. Bldg. ..... St. Paul
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DENVER ..... First Nat'l Bk. Bldg.
SALT LAKE CITY ..... Walker Bk. Bldg.
*SAN FRANCISCO ..... Russ Bldg.
*LOS ANGELES ..... 2087 E. Slauson Ave.
*PORTLAND ..... 777 Nicolai St.
*SEATTLE ..... 4th Ave. So. & Conn. St.
*United States Steel Products Company

TELEPHONE ENGINEER

192 N. Clark St., Chicago. Telephone, STAte 2657

PUBLISHED MONTHLY BY

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Exide
BATTERIES

With an Exide battery on the job, a long life of dependable, trouble-free service is assured. That is why Exides are so generally used by the telephone systems throughout the country.

THE ELECTRIC STORAGE BATTERY CO.
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Exide Batteries of Canada Ltd., Toronto

Guaranteed Cold Weather Blow Torches

have given satisfactory service since 1876

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No. 86 Pt.
For gasoline
Covered by patents.

Insist on the "ALWAYS RELIABLE" for long and satisfactory service. Made in all grades and sizes.

Order thru your distributor who will give prompt service and satisfactory prices.

Stocks of torches, also furnaces, in Newark, N. J., New York City, Chicago, and San Francisco.

OTTO BERNZ CO., INC., Newark, N. J.

Get EVER-PROTECT aid in your construction.

EVER-PROTECT has proved practical and profitable in making many hundreds of cable installations underground without a conduit. It protects cable against storm damage, corrosion, chemical action, electrolysis and abrasion.

In liquid form EVER-PROTECT is great for overhead work, protecting your cable and messengers against chemical action and other destructive influences.

Ask your nearest jobber for complete details.

National Cable Compound Co.
Incorporated
MITCHELL - - IND.

Note Protection at Corners

Blake Insulated Staples

Unequalled for telephone and bell wiring. The fiber insulation prevents troublesome short circuits and grounds. 4 sizes. Pat. Nov., 1900. Write for samples.

Blake Signal & Mfg. Co.
BOSTON, MASS.

Alert when idle

IN THE box, in the stockroom, in the switchboard, or in subscribers' homes, Columbia Gray Label Telephone Dry Cells are alert. Ready to provide life-giving current the moment the call comes. Reliable. Yet when the peak load has passed and the lines are quiet these remarkable cells rest and recuperate, restoring their energies. The cycle is repeated time and again for months on end; we have even had reports of Columbias lasting for several years. These are the batteries that cost less per month of service.

NATIONAL CARBON COMPANY, INC.
New York Chicago San Francisco
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Unit of Union Carbide and Carbon Corporation

COLUMBIA
TRADE MARK REGISTERED
GRAY LABEL
DRY CELL
FOR TELEPHONE
SERVICE
This dry cell combines both quality and service in the highest degree. Its quick recuperative power guarantees the greatest efficiency, reliability and long life for telephone use.
NATIONAL CARBON CO. INC.
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ATLANTA, CHICAGO, CLEVELAND
KANSAS CITY, LONG ISLAND CITY, SAN FRANCISCO
MADE IN U.S.A.
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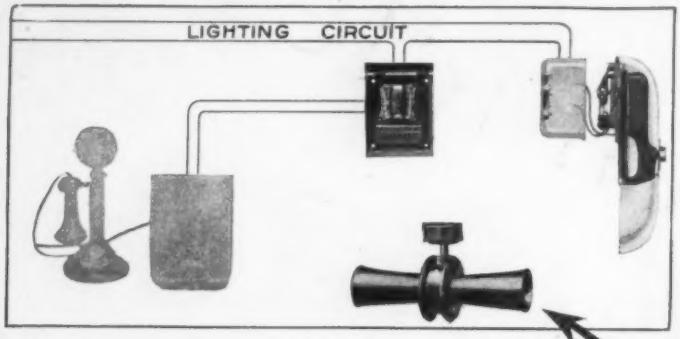
POSITIVE TERMINAL IN CENTER

Columbia
Telephone Batteries
Best by test—they last longer

PROMPT COMPLETION of Calls Assured With *Signal Engineering* Loud Ringing Telephone Sets



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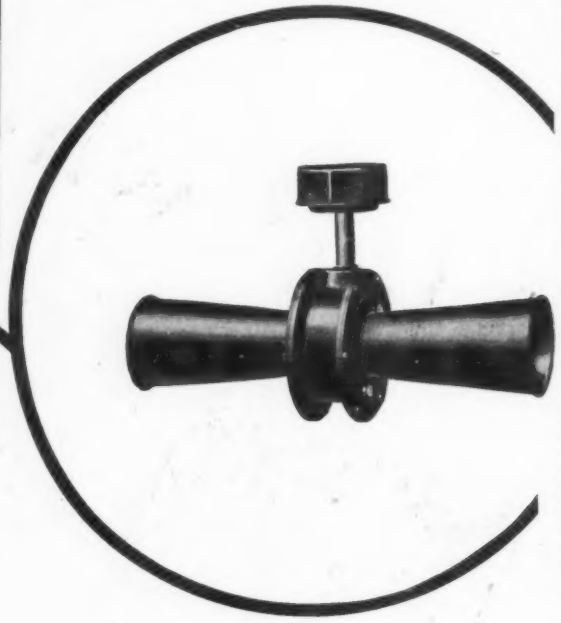

Designed for use where ordinary telephone bell is not loud enough to assure prompt answers. Relay operates on standard ringing current, picking up local power to ring a loud *Signal Engineering* bell or, where conditions are extremely noisy, a *Signal Engineering* duplex horn.
Relay supplied for AC or DC with either 1000 or 1700 OHM coil, with or without condenser. Note extreme simplicity of relay, outlet box and gong.
Their perfect efficiency and freedom from maintenance have been proven by years of use by leading telephone companies.

Samples for Test to Telephone Companies.
(Note Full Name and Address)

SIGNAL
ENGINEERING & MFG. CO.
154 WEST 14TH STREET, NEW YORK

Duplex Horn

"COPPERWELD" "Ecco Brand" Insulated Twisted Pair Drop Wire

TRADE MARK REG. U.S. PAT. OFF.

It takes more than just wire, rubber and cotton to make a quality drop wire.

In order to give satisfaction and long service, the rubber insulation of a drop wire must be able to withstand pressure, shock, friction, heat, cold and dampness—and above all, must be flexible and durable.

For insulating COPPERWELD "Ecco Brand" Insulated Twisted Pair Drop Wire only selected estates plantation rubber, the highest grade obtainable, with reclaimed rubber made from auto tires, and imported dry ingredients, are used.

The conductor is insulated to a definite diameter and covered with a close braid of long fibre cotton, giving maximum protection and wearing qualities to the wire. The braid is saturated with a penetrating wax compound, as a preservative, and covered with a high grade finishing wax which protects against the elements.

Made in accordance with specifications of the foremost engineers—of only high quality materials—protected through all stages of manufacture by rigid tests, COPPERWELD Twisted Pair is a standard quality product with a definite guarantee of performance.

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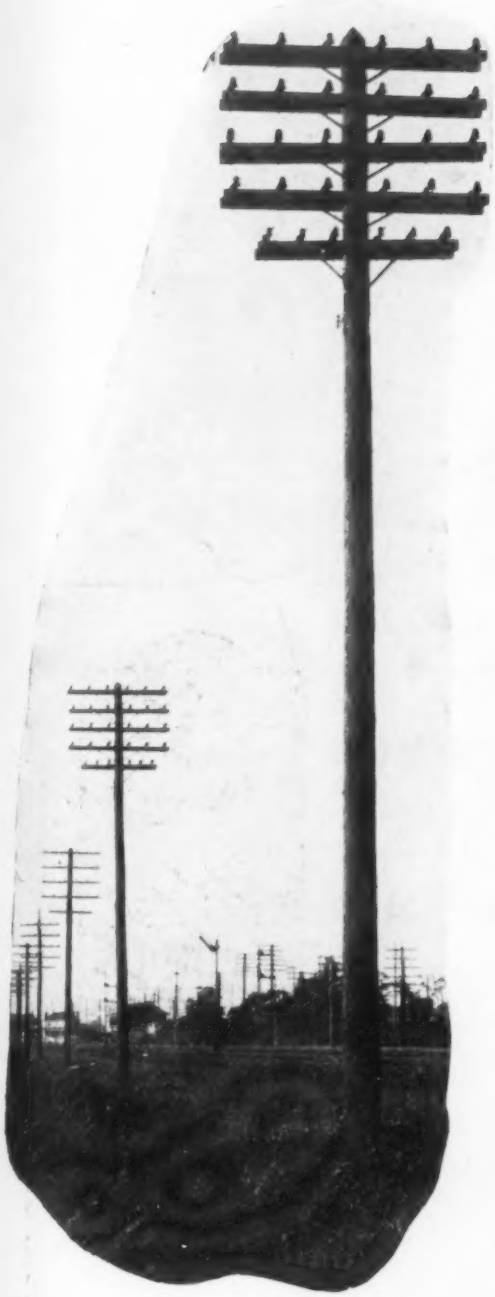
RIALTO BLDG., SAN FRANCISCO.

American Electric Company, Inc.
State and 64th Street
Chicago, Ill.
Distributor to the Independent Telephone Trade

It costs you $147 to "save" $7 on a 40-foot pole



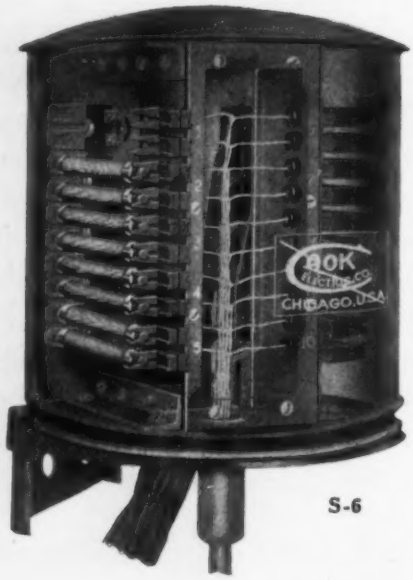
THESE 40-foot Southern Yellow Pine Poles, (Class "B," A. T. & T. Co. Specifications No. 4429), impregnated with 12 pounds of Grade 1 creosote oil per cubic foot, cost about $14 each . . . $7 more than the same poles cost untreated. They will last 25 to 40 years; the untreated poles, 3 to 5. Granting each its maximum life, 8 untreated poles at $7 each would be required to equal the service of one creosoted pole. That would be $56. Seven replacements of the original untreated pole would cost about $15 each in labor alone, or $105. In 40 years, then, your untreated pole has cost $161. The creosoted pole has cost $14.

Prettyman Preserved Poles will put this difference into your pocket. Regardless of the type or size of untreated pole you are now using, there is a Prettyman Preserved Pole to replace it with a proportionate reduction of your pole costs . . . to stand faithfully in line and work for you 25 to 40 years . . . earning good will and increased profits through uninterrupted line service . . . saving for you the dollars that have been going back into your line to feed destructive termites (white ants), woodpeckers and decay-producing fungi.

Possibly you use a smaller, lighter pole than the 40-foot, Class "B" stick. Prettyman Preserved Poles cost anywhere from $3.50 for the sturdy little fellows to $40 for the giant 70-footers. All, however, will increase your profits in proportion to the investment you make. The case of the Class "B" 40-foot pole is representative. Write today for complete information . . . for prices on the sizes you use.

J. F. Prettyman & Sons
Wood Preserving Plant
Charleston, S. C.

COOK



S-6

THESE terminals offer a perfect means of terminating and distributing lead covered cable.

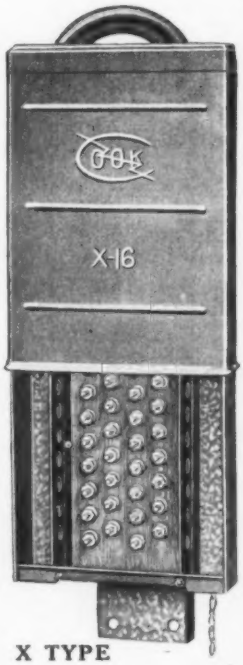
The S-6 provides adequate protection.

Drop facilities on both terminals have the approval of the Engineer and the lineman.

Built of steel, they outlast any other type of terminal made.

Their adoption as standard by companies the world over has forced a production that enables us to manufacture and sell these quality terminals at very low prices.

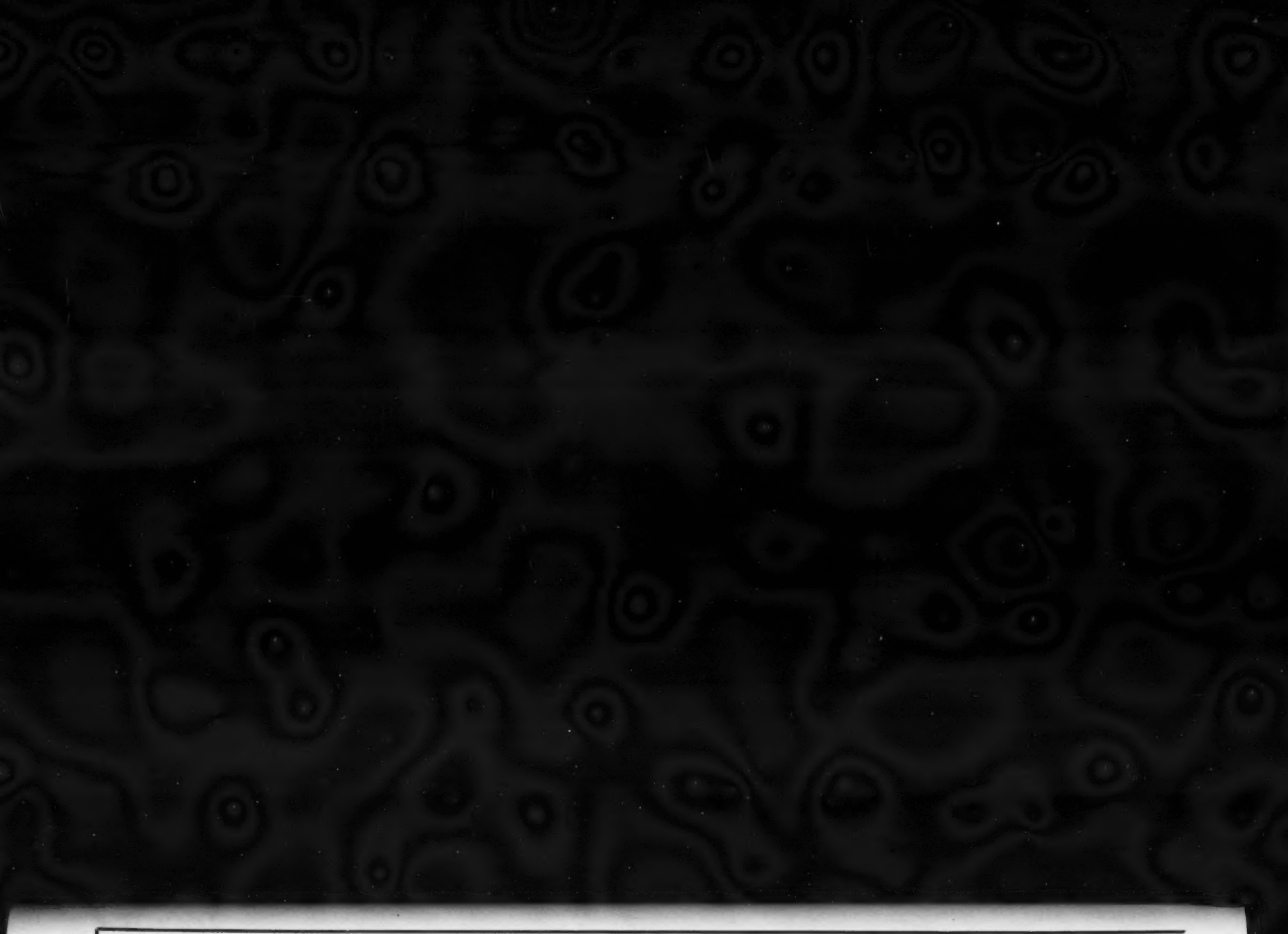
Detailed information and prices gladly furnished.



X TYPE

COOK ELECTRIC CO. 2700 Southport Ave. CHICAGO

COOK



Telephone Engineer

Volume 32 DECEMBER, 1928 No. 12

Profit on the Turnover

The telephone industry as a whole, and nearly every unit of it, is facing a constantly increasing investment in fixed capital. Statistics show that for the last ten years the cost of fixed assets per station has been steadily increasing. Barring a return to pre-war levels of material and labor prices, this tendency to increase will continue until all plant constructed at lower price levels is replaced by plant constructed at present prices.

With increasing investment and with interest, depreciation, taxes and other charges increasing proportionally, every telephone company is faced with the problem of providing the additional revenue necessary to carry the increased charges. One method of securing the additional revenue is by adjustment upwards of the general rate schedule and the other is by developing special services which may be sold to the subscriber in addition to his main station service.

Rental revenue from main station subscriber service is and will continue to be by far the largest source of exchange revenue. If an adequate increase in the main station rate can be obtained, the problem of increased revenue is immediately solved. The amount of increase can be estimated quite accurately and once obtained little effort is required to maintain the level of earnings. For some companies which are still operating under lower-than-average rates it is a solution that should be worked out with as little delay as possible.

In many cases, however, management hesitates to apply the solution because of several disadvantages. It is unnecessary to enumerate them, but they include factors of time, public relations, removal of a certain marginal group from possible users, etc. The development of supplemental revenue is a complete answer in some of these cases and a partial answer in all.

The telephone business is notoriously one of slow turnover of capital and the main line subscriber station is one of the slowest elements in its turnover. In recent years business in general has learned that profits come from increased turnover and the telephone business may well learn the lesson and turn its attention to those items of its service that will tend to increase the turnover of its capital.

To the average exchange having small toll investment but participating in a percentage of the toll business it develops, the increase in toll business offers an increased turnover on small investment. Other sources of supplemental revenue are public pay station revenue and the many supplemental services so ably discussed by Mr. McCulla and others at the recent national convention.

It follows that if an increased turnover of capital is to be obtained from these supplemental sources of revenue, the rates fixed for them must bear a more liberal relation to the capital required than is the case of main line service. This is as it should be, since they are in the form of increased service or added convenience and are sold to those subscribers who can afford to have them and are willing to pay for them. The cost of service theory of charging should be discarded and the value of the service should be a controlling factor in establishing the charge.

It is admitted that this is contrary to the practice of certain public service commissions in approving rates, but it is the only method of preventing further increases in general rate levels. An active and aggressive commercial policy on the part of telephone companies in developing these sources of supplemental revenue and a more liberal attitude of commissions in establishing rates for these supplemental services will go a long way in preventing the necessity of general rate increases.

The Plant Situation

It is axiomatic that no business can stand still. It must either progress or it must go backward. In the telephone business there is an intimate relation between the condition of the business and the condition of the physical property, the telephone plant. No telephone system can make progress with a constantly deteriorating physical plant.

The end of the year is nearly here and the time will soon come for determining the final results of the year's business. Indispensable as are the balance sheet and income statement in determining the results of the year, they may be misleading unless the plant situation is also taken into account.

It is not easy to put down in figures the condition of the plant and to measure its changes for better or worse as compared to a year ago, and yet some comparison is essential to show the true state of affairs. There are some figures that are useful as, for instance, amount of plant replaced both by total money cost and by units, percentage of cable fill to determine if sufficient additional facilities have been provided, total number and per-station figures on subscribers' complaints, etc. There are many things, however, that can not be found in the figures for any given year. Among them are maintenance of transmission levels, temporary or uneconomical work that will result in future trouble or loss and many other things.

Until someone can develop a more accurate measure, there is no better way than a general survey of plant conditions made by a man who is familiar with the situation in the particular plant. Such a survey will be of value in determining not only whether the plant is in better or worse condition generally than a year ago, but will be of much use in planning the program for another year.

The Work We Love

It is an old saying that a man likes best the work that he knows best. The men and women of the telephone business certainly must "know their stuff" for it is difficult to conceive of any business that has a stronger hold upon those who give their time and effort to it. Recent changes in the industry have temporarily removed some of the personnel who have contributed their part in building up the telephone systems of the country, but many of them are already finding their way back into it in other places and in other ways.

It may be that the old saying is true; it may be that telephone work is inherently more interesting than other vocations, but after all, we believe that the real reason is because it is human nature to want to be of service to other human beings. The telephone art is essentially one of being of service to all the people of the community and because it gives an outlet for a natural desire in man, it has an appeal which, once having been satisfied, craves further satisfaction in continued service.

As holiday time draws near, our thoughts turn to the many to whom we would wish to send greetings and heartfelt wishes for a joyous and prosperous season. A personal greeting to each of the thousands of friends of TELEPHONE ENGINEER is obviously impracticable, and so we take this means of saying to all of our readers, our contributors and our advertisers that we hope that Christmas will bring them an abundance of joy and peace, and that the New Year will be one of continued happiness and prosperity.

Books on Construction

One of the inquiries that comes to us frequently from the telephone field is, "Can you recommend a book on ————?" It is usually possible for us to suggest some of the excellent books that have been written by telephone men as being suitable for the enquirer's needs. However, when the inquiry takes the form "Where can I get a book that gives construction specifications?" "Is there any book that tells how to test and splice cable?" "Where can I buy a handbook like the Bell company furnishes its foremen?" we are not able to give a satisfactory answer.

It is true that there are chapters on construction in some of the existing text books which give some general information, but these are not in sufficient detail to meet the needs of many men in the field. What these men want is exact detail and dimensions. They need to know the proper distance of the guy clamp from the pole for down guys and for messenger terminations. They must find out the proper size and spacing of cable rings for various sizes of cable. They are interested in knowing the best method of rigging to raise a new pole with a power winch, using the old pole as a gin. They are anxious to learn what general experience has found to be the one best way of doing each of the multitude of varied jobs that come up in the line of duty of the construction man.

We have wondered and have expressed our wonder in these columns why no one has undertaken the preparation of a book devoted exclusively to construction problems of the telephone plant. The answer that construction men are doers, not writers, is inadequate, for there are plenty of construction handbooks in other fields. We have not given up hope. Perhaps some day there will be someone who will recognize the need of a telephone construction handbook and will supply the want.

Studying Telephone Methods

By E. R. COLLINS

Manitoba Telephone System, Brandon, Manitoba, Canada

CHAPTER 23

Line Leakage, and Resistance

The line equipment at the Telephone Exchange must be so designed and adjusted, that it will give dependable service with the lines to which it is connected. There are two factors which govern the operation of the line signal, that is resistance and leakage.

The resistance of the subscriber's line or loop, as it is usually called, is made up of the resistance of the telephone instrument, the inside wiring, the drop wire, open wire line if any, the aerial and underground cables, heat coils at the rack, switchboard cables and the resistance of the line relay. An average adjustment of the line relay is usually sought so that the line relays will put up in series with the longest average line connected to the system. Special lines must receive special adjustment.

This average adjustment is quite necessary, because the changes due to subscribers moving, and other changes, require that a given circuit number will be working on a short line one time and a long line the next. An average of 1000 ohms of resistance outside the line relay is usually allowed as a safe average for the series resistance of the line. This would mean that with a 24-volt battery, and a 1100 ohm line relay, connected to a line of 1000 ohms resistance, that there would be a 12 mill-amperes of current flowing over the line. The relay must therefore be adjusted to pull up with a current flow of 12 mills.

CONVENTION SCHEDULE

South Dakota, Cataract Hotel, Sioux Falls, January 15-17.

Arkansas, Marion Hotel, Little Rock, January 21-22.

Minnesota, Hotel Lowry, St. Paul, January 22-24.

Oklahoma, Lee-Huckins Hotel, Oklahoma City, March 12-14.

Texas, Hotel Texas, Fort Worth, March 25-27.

Ohio, Deshler-Wallick Hotel, Columbus, April 16-18.

Indiana, Claypool Hotel, Indianapolis, May 7-9.

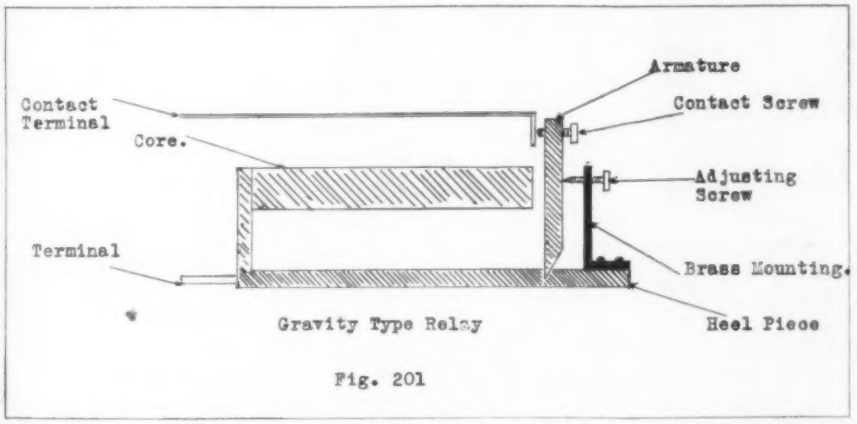


Fig. 201

In Fig. 201 is shown the cross section of a typical line relay. This is known as the gravity type of relay. The armature is a heavy piece of soft iron cut to a knife edge at the lower end. This knife edge rests in a slot cut in the heel piece of the relay. In some types, the battery is connected to the heel piece or frame of the relay. The armature must make contact with the heel piece by means of this knife edge resting in the slot. The relay is made more sensitive, by turning the contact screw out, and bringing the adjusting screw up so that the armature comes closer to the core. The sensitivity of any relay will increase very rapidly, as the gap between the armature and core decreases.

In some types of gravity relays, there is a spring connected between the armature and the heel piece to bridge over the knife edge. Where this spring is not supplied trouble will often be found. The armature will pull up, but the line lamp will not light. The contact screw may be touching the contact spring, and the line lamp circuit be correct, and yet the lamp not light. The trouble will probably be due to dust accumulation in the slot of the heel piece. The brass arm to hold the back adjusting screw may be removed and the slot and armature be cleaned. This can also be easily cleaned by using a piece of ½ in. cotton twill tape. Pass the tape through between the armature and the back adjusting screw support, and then work it back and forth down into the slot. For extremely dirty relays where the dust has gummed on the iron, use the tape with some carbon tetrachloride. Dip the tape in the liquid, then pass it through the relay.

Next use a clean piece of dry tape to burnish the surfaces as clean as possible.

It wil be noticed that the support for the back adjusting screw is made of brass. This of course is to allow the full force of the magnetic pull to pull the armature to the left. If this was made of iron and was bolted to the heel piece the armature would have a tendency to pull to the right.

The heel piece is bolted to the core of the coil with an iron screw. The writer has found cases where a brass screw had been used in place of an iron screw, or where a brass washer was inserted between the core and the heel piece. The result is of course a weak magnetic field, and consequently a relay that will not adjust properly.

Leakage Adjustments

The armature may be tilted so far ahead that it is on the verge of sticking. However, it has satisfied the 1000 ohm series resistance test. There are conditions where this adjustment will cause trouble.

Referring to Fig. 202 we have the double coil line relay connected to a telephone. The ringers are connected across the line through a condenser. There will be a battery connected to this line continuously, and therefore a voltage stress across the terminals of the condenser. Quite often a condenser will show a very high resistance leakage to battery flow. If this leakage is high enough, then we might find that the line relay too closely adjusted will pull up continuously. The question then arises how much leakage can we allow for safety in giving good service? A safe margin of leakage is 10,000 ohms. This leakage may be due to a bad condenser, or due to dampness in inside wiring, or any other part of the telephone circuit. Under certain conditions, in some climates, a certain amount of leakage must be expected. If the line relays are adjusted to operate through the 1000 ohms series, and the 10,000 ohms leak, they can be relied on to give service over average conditions of weather.

Line and Cut Off Relay Test Set

Some method of testing and adjusting line relays must be used to secure a uniform adjustment. For instance while the series resistance gives a current flow of 12 mills, the leak of 10,000 ohms will allow a current flow of 2 mills. We could therefore adjust the relays with a current

flow test set using a milliameter, or we can use a test set with a 1000 ohm, and a 10,000 ohm resistance for the two values.

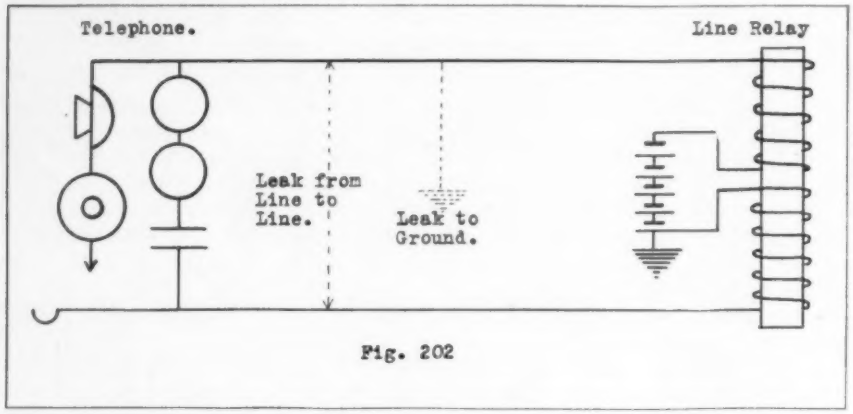


Fig. 202

In Fig. 203 we have a circuit that can be used to test the line relay adjustment. There is a switchboard key connected to the tip and ring of the line by a flexible cord. This cord can be equipped with a standard plug and the testing done from the multiple or line jack of the switchboard. Where the testing is done from the line or answering jack, the line lamp can be used to check the operation of the line relay. When the plug is inserted there is a circuit from the line relay through a 10,000 ohm resistance. This may not pull up the relay armature. Press the button "B" 1, and the 1000 ohm resistance is connected in series with the line relay. This should pull up the armature and light the line lamp. Now release the button and you may find that the line lamp still burns. The reason is that the core of the relay has been saturated through the 1000 ohm resistance flow of 12 mills, and the flow of 2 mills is sufficient to hold the armature pulled up, whereas the armature would not pull up with a flow of 2 mills before the core was energized by the 12 mill current flow. It is therefore advisable to have the 1000 ohm coil pull up the relay armature, and then see that the 10,000 ohm flow will not hold it.

Provision is also made to check the operation of the cut off relay springs. If one spring cuts clear of the line the lamp may go put, but still leave an unbalanced line condition which would interfere with the proper operation of the cord circuit relays. To check this condition operate *"K"*-1 with the test plug still in the line jack under test. It will be necessary to connect battery to test set by means of a cord and plug or to a pair of binding posts on the test set. A circuit can now be traced from the negative side of the line relay, through the cut off relay springs, through the resistance R 1 to ground. Another circuit can be traced from the positive side of the line relay through the cutoff relay springs, through the resistance R 2 to negative battery. Then if button B 2 is operated, it will pull up the cut off relay and should break the both sides of the line to the line relay. If only one side breaks the line lamp will burn, since the armature of the line relay is energized through one winding of the line relay.

A check of all the lines on the switchboard can be made both for the operation of the line relay, and the operation of the cutoff relay springs. The test set may then be taken to the intermediate frame and be connected to the terminals by using a special tool, supplied for this purpose. If the cord is long enough you can connect the tool at the terminal strip of the I. D. F. and carry the test box to the relay rack. This cord should have four conductors to connect the *tip, ring, sleeve* and *line lamp* to the test set. The battery can be picked up any place on the relay rack. The lamp in the test set now takes the place of the line lamp on the switchboard. The relays can be adjusted until they operate correctly. It may be impossible to adjust all line relays with the lines connected. A test with the voltmeter will probably show some leakage on the line you are testing. This leakage in parallel with the 10,000 ohm leakage of the test set will prevent you making the proper adjustment. Remove the heat coils and then make your adjustment. If the line relay will not operate correctly after you have adjusted with the heat coils removed; then the conditions imposed by the line must be investigated and the trouble removed.

There are proper tools supplied for adjusting relays. The manufacturer of the equipment you are using can always supply you with the proper box wrenches, spring benders and other tools. Using plyers to turn the contact screws and lock nuts, soon burrs them so badly that it is impossible for the fellow that follows you to turn them. The cost of these tools is small compared with the improved appearance of the apparatus. Better and closer adjustments can be made with the proper tools.

The cost of making up a test box, if you have not one, is small. Standard flat resistances can be used. The buttons "B" 1 and "B" 2 can be push buttons such as used in a rural telephone. The key may be any good type of switchboard key. The cam type is preferred as it requires less motion to operate it. Any good pair of make and break contacts can be used in this key. There are standard test sets supplied by the manufacturers for making necessary tests, and these should be used where possible to obtain them.

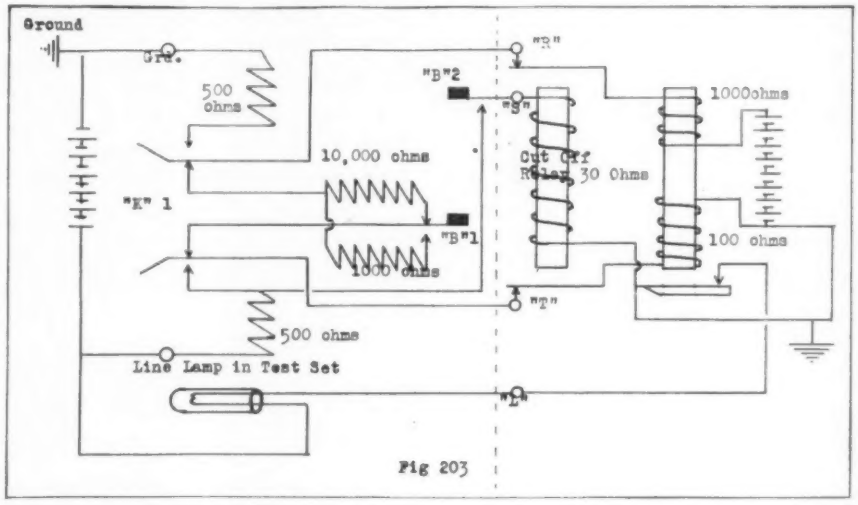


Fig 203

Party Lines Common Battery

In the previous chapter we mentioned that one use of the intermediate distributing frame was to provide two party service. There are two general types of two party line services, that is, the *jack per line* and the *jack per station*. In the jack per line, one multiple and line jack circuit is used. The ringers of one telephone is connected to one side of the line, and grounded through a condenser. The ringer of the other telephone is connected to the other side of the line and grounded through a condenser. The cord circuit is provided with two ringing keys, so that when one key is pulled, generator is sent over one side of the line to ground. The other party is called by using the other ringing key which sends generator over the opposite side of the line to ground. This provides a selective

ringing service, that is, one party can be called without calling the other party. Since the operator can be called by removing the receiver from the hook, a very good type of selective service can be given.

The directory listing of such telephones is a number associated with a letter. Thus John Smith may be 456 K and Jim Jones be 456 L. In this system it is necessary to have a plan of marking the jacks so that the operator knows whether one or two parties are connected to the line.

The jack per station system permits the use of separate numbers without the letter. Thus we might have telephones 2341 and 3128 connected to the same line. The plan for doing this is shown in Fig. 204.

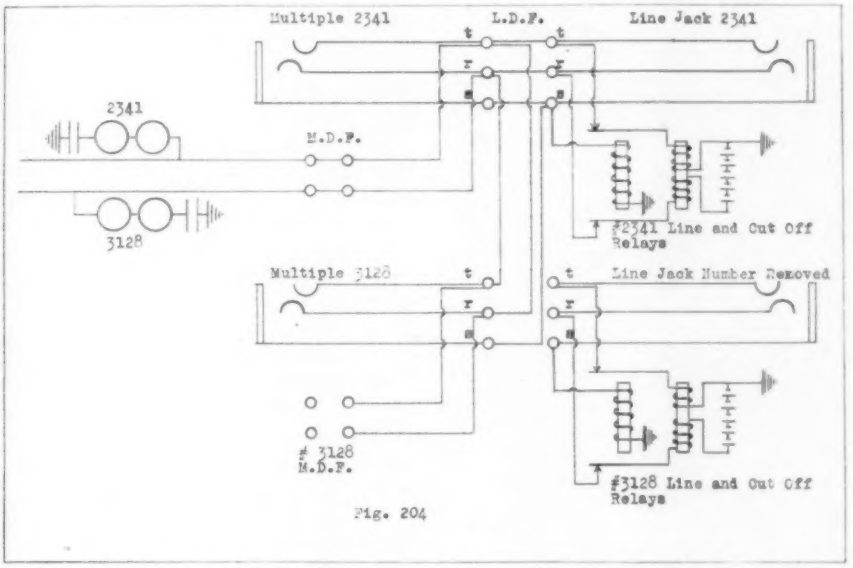


Fig. 204

In this drawing we have omitted the line lamp for simplicity. We have shown the line jack and line and cutoff relays for line 2341 connected to the multiple of 2341 at the I. D. F. It will be remembered that the multiple jacks are connected to the lines to the M. D. F. or main frame.

Line 2341 is shown connected to two telephones. The ringers only are shown connected to their respective sides of line 2341 through the condensers.

The line jack and line relay equipment of line 3128 have the jumpers removed at the I. D. F. There is a set of jumpers, tip, ring and sleeve connecting the multiple jacks of line 3128 to the line and multiple jacks of line 2341. But the *tip* of 3128 is connected to the *ring* of 2341, and the *ring* of 3128 is connected to the *tip* of 2341.

Suppose that the cord circuits when connected to grounded generator, have the live side of the generator connected to the tip of the cord. Then if a plug is inserted into multiple jack 2341, generator will flow over the tip of this line to the ringers of telephone 2341, to ground through the condenser. If the plug is placed in the jack of 3128, then generator flows over the tip of jack 3128 to the ring of line 2341, over the ring side of this line to the telephone 3128, to ground.

This system leaves one circuit dead on the main frame, and also leaves the line jack and relay equipment of 3128 lying idle. In a big system this would run into quite a large investment of idle line equipment. On the other hand, a cord circuit with only the one ringing and answering key is needed. In this system it is necessary to provide a special busy test. This is known as a reverting busy test. Unless this special busy test were provided, the operator might answer a call from 2341 asking for 3128. She would touch the multiple of 3128 and get a busy test. When she receives the reverting busy test, she instructs the calling party to hang up while she rings 3128. The reverting busy test simply informs the operator that the party called is on the same line as the calling party. The circuit of the reverting busy will be described under the hearing of the operator's circuit and cord circuit.

Noise on Party Lines

Two party lines have the ringers connected to ground one on each side. In certain localities this arrangement causes lines to be noisy. The peculiar part of this trouble with some types of telephones is that the line does not sound noisy from the office end, but listening at the subscriber's telephone, quite a loud hum will be noticed.

In Fig. 205 is shown the circuit of a common type of common battery telephone. There are three terminal posts, L1, L2, and Ground. For ordinary metallic service where only one subscriber is connected to a line, the terminals L 2 and Ground are connected together. Where used for two party line service the line wires are connected to L 1 and L 2, and the ground wire to the ground terminal. We will suppose that the locality where the trouble is reported, is parallel with a street railway track. If the bonding system of the street railway is bad, there will be quite a high resistance offered to the return of the 500 volt direct current from the street cars. Any circuit that offers a little lower resistance path, will be followed by the return current flow from the street railway. If the receiver is lifted from the telephone in Fig. 205, there will be a flow of direct current from the ground, through the ringers, through the induction coil and receiver, and divides, part going through the transmitter to battery at the Telephone Exchange. The rest of the current flows through the other half of the induction coil, back to ground at the Telephone Exchange. If the coil at the Exchange is balanced, such as would be the case in a cord circuit, there would be about an even division of the current over the two sides of the line in the same direction. This even distribution of this current flow makes practically no noise when listening across the line at the Exchange or at other points along the line. Listening across the line at the telephone itself, shows very little noise. Yet the noise will be quite loud when listening with the receiver of the telephone. Now refer to Fig. 205 again, and note that the total of this current flow will be through the primary winding of the induction coil, and the receiver, then divides. At the same time there is a charge and discharge action across the

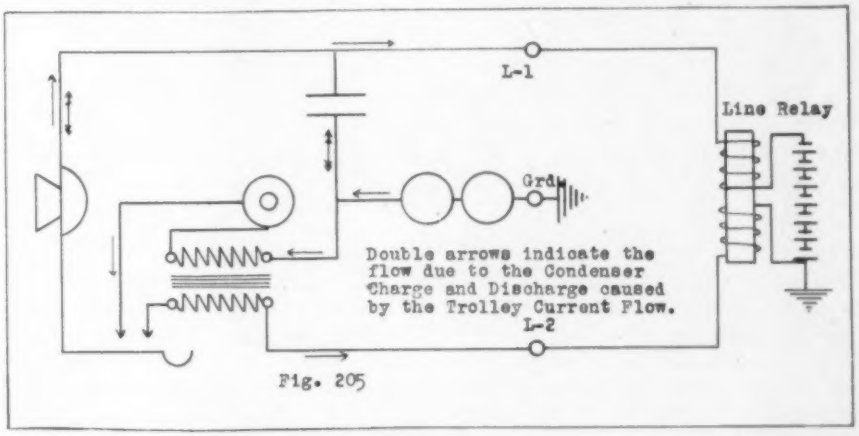

L-1
Line Relay
Grd
Double arrows indicate the flow due to the Condenser Charge and Discharge caused by the Trolley Current Flow.
L-2

Fig. 205

condenser which increases the noise in the receiver. In other words, this noise is local, and noticeable only in the receiver of this telephone. There are two methods that can be used to overcome this trouble, and both of them require a change in the circuit arrangement.

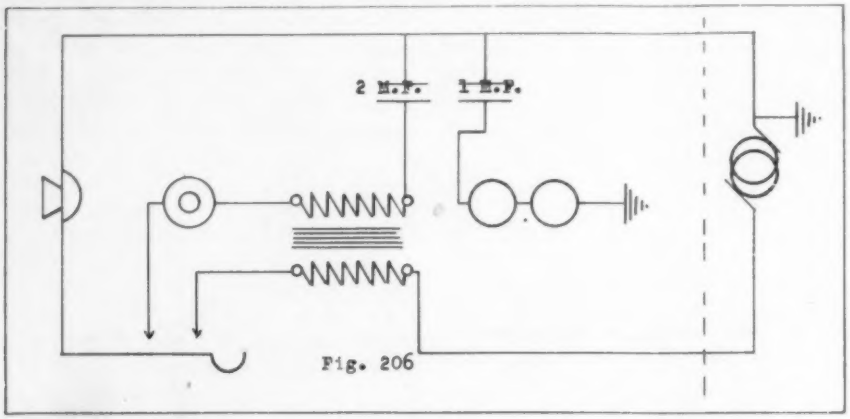


Fig. 206

In Fig. 206 we have shown the telephone and the generator connected from the exchange. There has been an extra condenser added to the telephone separate from the condenser in the talking circuit. Here the direct current flow from the street railway has been blocked from the line by the condenser. The impedance of the ringers will block out any high frequency currents, so that the voice currents will not be shunted to ground. The circuit will now be quiet, when listening at the telephone as shown in Fig. 205.

Another type of circuit is sometimes used where the disturbance is very bad. This is shown in Fig. 207.

In this circuit there is a relay installed in the telephone. This relay is a special type, and the armature is built so that it will respond to the low frequency ringing current. When the ringing generator is sent out over the line it will operate the relays in both the telephones connected to the line. In Fig. 207 the generator is grounded on one side. The relay will pull up its armature and connect the grounded ringer to the live side of the line and will operate the bell. The bell at the other telephone on the same line will not ring, but the relay will operate. Unless this relay operates quietly it will call the attention of the subscriber that the other party is being called. Under talking conditions, the grounded ringers are cut away from the line. This system while more costly will overcome the noise conditions when the extra condenser fails to do so.

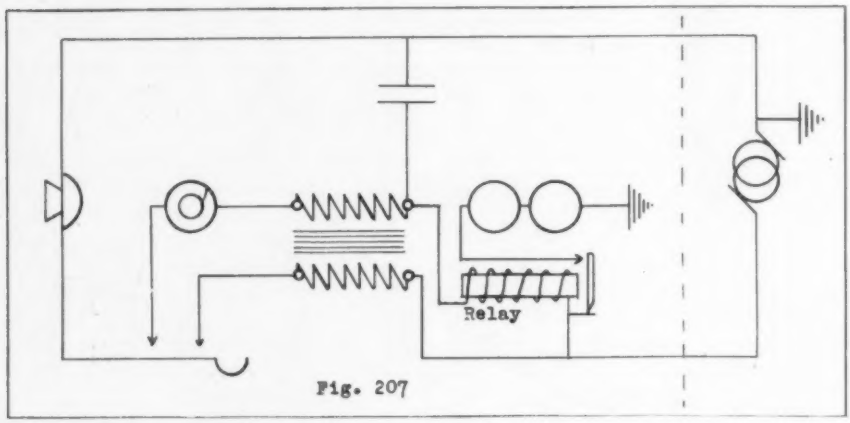


Fig. 207

In Fig. 204 there is shown a bell and condenser, one on each side of the line. If these telephones are not too far apart, the line will be nicely balanced by the equal impedances connected to the two sides of the line. Suppose one subscriber wants an extension telephone or an extension bell added to his equipment. If this bell is bridged with the bell already installed, it will unbalance the line. There will be an impedance of one ringer on one side of the line and an impedance due to two ringers in parallel on the opposite side. This can be overcome by adding a dummy ringer to the telephone with only one ringer impedance and give the impedance of two ringers in parallel on both sides of the line. This may only be necessary in extreme cases, however.

Utility Charges Too Steep—Commission

Expressing its belief that utility rates in Indiana generally are too high and consolidation of utility properties in many instances is "adverse to public interest," the public service commission recently gave reasons for its denial of the petition of the Standard Telephone Company to merce nine telephone companies scattered over the state.

Last week the commission rejected a tentative order approving the merger and directed the preparation of another order detailing reasons for the refusal. The petitioning company was formed by interests with which Max F. Hosea, Indianapolis promoter, is connected. It proposed to acquire telephone properties of the following companies: Royal Center, Greentown, Greenfield, Greencastle, Attica, Putnam County, Steuben County, Waynetown and the Logansport Home Telephone Company, and to issue securities to finance the proposal.

Opposition to the plan arose in some localities which would have been affected by the merger. One reason given by the commission for denial was that the properties to be merged are scattered over a wide expanse of territory. Some of the properties affected, the commission said, already are parts of other merged corporations. Several specific instances were cited where rate increase petitions followed successful consolidation petitions with the commission.

Determined on Remedy

Although the matter of rates is not raised directly in the present case, the commission asserted:

"The commission believes that utility rates generally are too high. It is determined to remedy this situation. This is not a rate case, but value determined in this case will be evidence of value in subsequent cases. The commission insists on its lawful right to approve or disapprove matters that come before it for sanction in the light of all evidence which it has, bearing on such matters.

"Speculation in utility properties within this state has been very pronounced in the last few years. It is very clear to the commission that the tendency to inflate purchase and sales prices of utilities is a result of undue speculative activity. Purchase and sale price is used as a basis of security issues and becomes a factor in establishing fair value, which in turn determines rates. The commission can not hope successfully to control rate making or the issue of securities if the present speculative activity among utilities is not more effectively controlled. Oftentimes unreasonable prices are paid for utilities. So long as valuations, security issues and rates keep pace with advancing purchase and sale prices this practice will continue. Such a process is clearly adverse to public interest. The control of such matters is delegated by law to this commission. This commission feels it to be its duty to curb undue speculation in utilities within this state."

Repeater Installations

By F. J. DOMMERQUE
Fellow, A. I. E. E.

Preliminary Explanations.

From previous discussions it has become apparent that the 21-type repeater is not suitable for long lines except when used in four-wire repeater circuits, and that for long lines from five to six 22-type repeaters may be placed in tandem. Each of these repeaters is provided with a bridge consisting of a repeating coil and a balancing network, which are not required for each one of the 21-type repeaters in a four-wire circuit, because they operate in one direction only. However, a bridge is required in a four-wire circuit at the points or stations where the four-wire connects with the two-wire line. To prevent "singing" the total amplification of both branches of the four-wire circuit in series must be less than the total transmission equivalent. To prevent "echo effects" and reduction of the propagation velocity of currents in cable the balancing networks at the connecting points of the four-wire to the two-wire circuit must be particularly accurate.

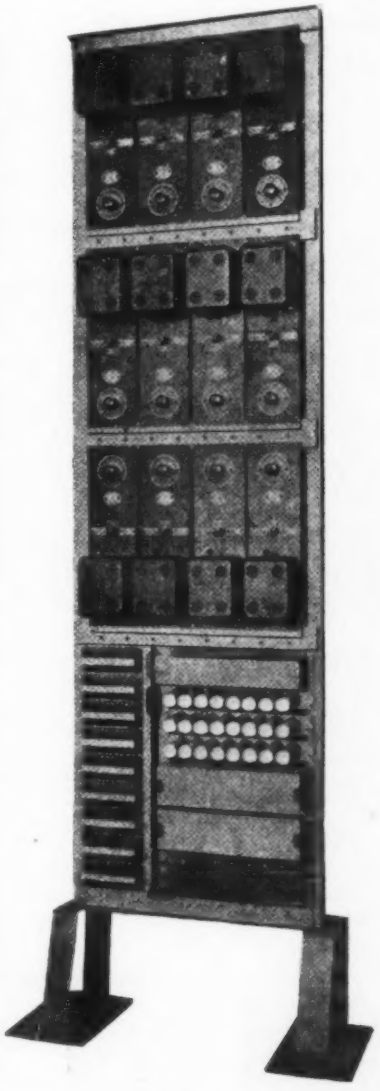


Fig. 1

The repeaters so far described have been *directly* connected in the line, they are therefore designated as "through-line" repeaters, they are installed as a fixture at intermediate stations serving solely as repeater stations.

There are, however, cases where two

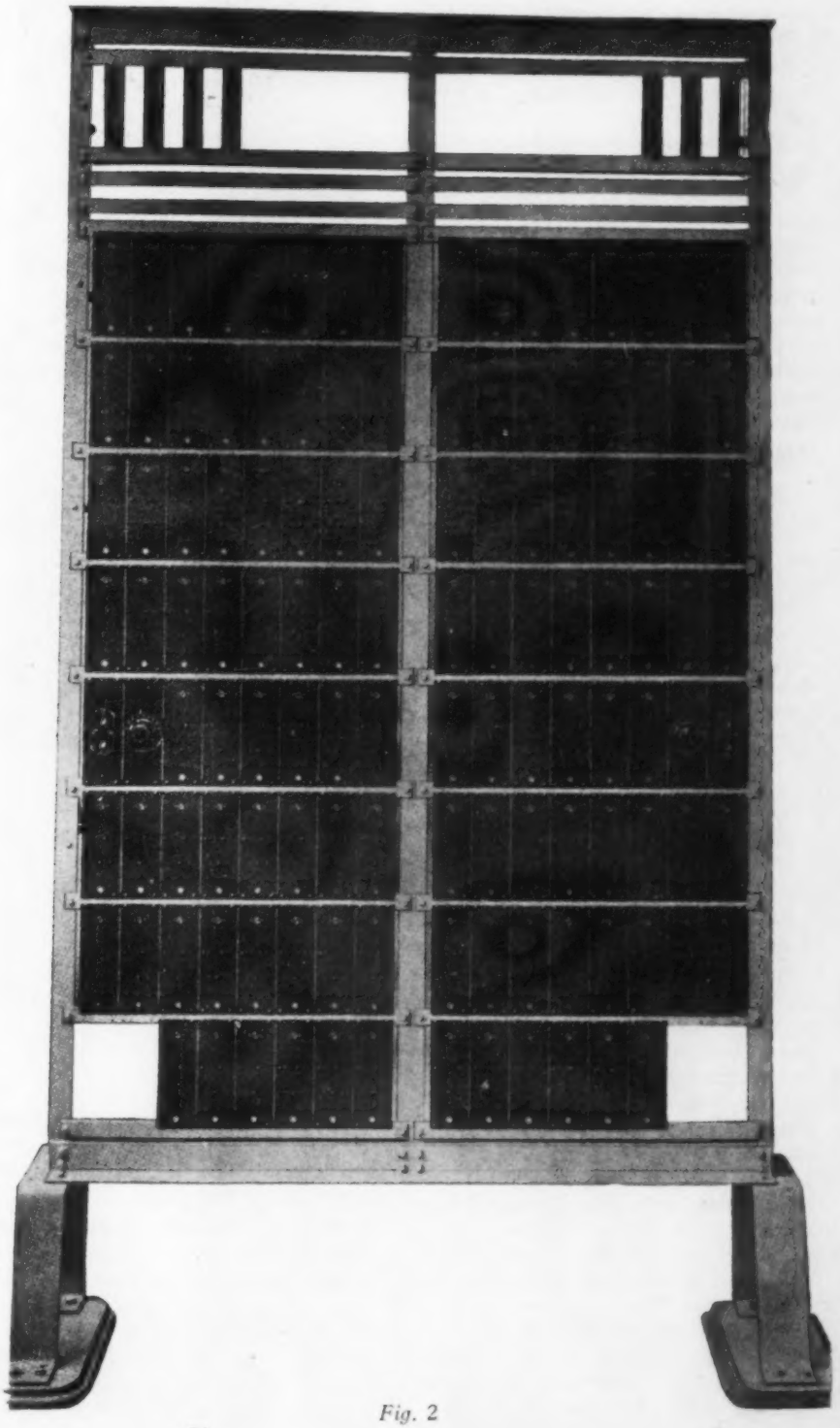


Fig. 2

long lines have to be connected which vary in their characteristics; in such a case the same balancing network would not work satisfactorily with all of such lines that may be connected together. For such purposes special repeaters have been constructed, which have received the name "cord circuit" repeaters, because the two ends of each circuit are attached to plugs under the control of an operator, to enable her to connect into any pair of circuits terminating before her which are properly constituted for repeater operation. The cord circuit repeaters may terminate in double plugs, whereby a connection can be made simultaneously to a jack in the switchboard whereto the toll line is connected and another jack located immediately below this toll-line jack, a balancing network corresponding to the actual line being connected to the extra jack.

The description of the repeater installation given here is not of any particular repeater station, but made in a general way so as to confer an idea of the most practical arrangement for repeater service. The illustrations, moreover, pertain to European apparatus which shows in a most pleasing way the care taken to protect everything against dust, dirt and damage.

Apparatus Arrangement of Through-line Repeater Station.

The toll or long distance line passes through a distributing frame to a jack in the jackpanel of a small switchboard similar to a one-position upright magneto section or to a private branch exchange board. In this board all tests can be made. The following 7 jacks are provided for each side of the line and placed one above the other.

1. Listening-in jack;
2. Toll line jack;
3. Repeating coil jack (line side);
4. Repeating coil jack (repeater side);
5. Apparatus jack;
6. Balancing network jack (apparatus side);
7. Balancing network jack (balancing network frame side).

As the balancing networks for a number of lines are mounted together on a separate frame the balancing network jack No. 7 is duplicated on this frame as an extension.

From jack 5, which is connected in series with jack 4, the line is extended to the repeater frame, upon which are mounted the repeater units and in its lower part the ringing relays and connecting racks. A complete repeater frame, containing 12 repeater units is shown in Fig. 1. Fig. 2 illustrates a balancing network frame and Fig. 3 a switchboard for 30 through lines. A repeater unit is shown in Fig. 4, closed and open. The repeater unit contains the following apparatus:

1. The repeater tubes; preferably also duplicate tubes, which can be cut in circuit automatically in case something should happen to the tubes in use;
2. Potentiometer;
3. Transformers;
4. Filters;
5. Resistances;
6. Condensers;
7. Connecting rack.

In the switchboard below the line jacks

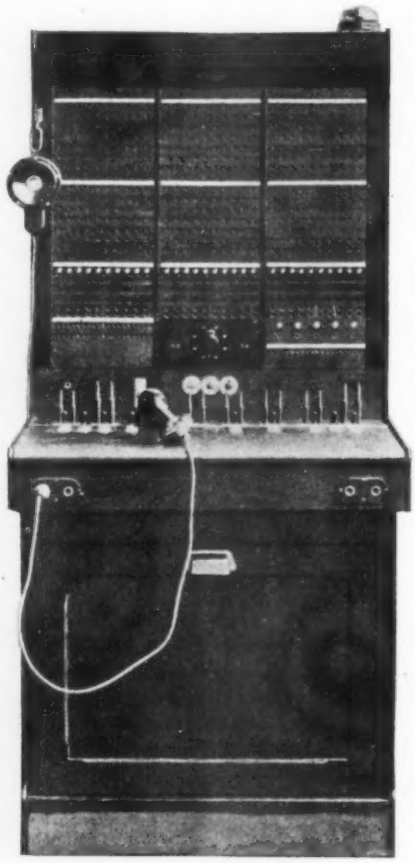


Fig. 3

are inserted strips of ringing lamps, ringing buttons, listening-in jacks and jacks for special purposes. In the lower part of the middle panel is located an artificial line for measuring, and in the lower part of the third panel lamps and jacks for 5 service lines and a strip of 20 jacks for particular purposes.

The plugs and keys in the key-shelf are for measuring and testing. To describe the measuring and testing methods would lead too far. The apparatus is fused wherever necessary. All apparatus fuses are arranged upon a fuseboard located adjacent to the repeater frames.

Through-line Repeater Station Plan.

In Fig. 5 is given an example of a through-line repeater installation with an initial equipment for 120 repeaters. It must be kept in mind that the two circuits of a four-wire circuit take one repeater unit. In the plan of the building provision is to be made for future extensions. It is assumed that the powerplant is installed in the basement. As the powerplant has all the features of a powerplant for a common battery exchange, it will not be necessary to show a plan; a description of the requirements will, however, be given presently.

The 120 repeaters are placed upon 20 repeater frames of 6 repeater units each. The frames are arranged in four rows of 5 frames each, with a fuseboard for each two rows. The frames are marked RF in the plan and the fuseboards FB. As the local connections between repeater frames and switchboard are most numerous, the switchboard, marked SB, is best located in close proximity to the repeater frames. There are four switchboard positions, each one corresponding to 30 repeaters with a test position TP at the one end. There are required two sections or bays of balancing network frame BNF and also two bays of supplementary network frames SNF, if supplementary networks are used. These frames are located adjacent to the distributing frame DF, upon which the toll lines terminate, respectively arrive and depart.

Of course, the floorplan shown will not fit any type of repeater design and circuit, but may serve as a good illustration of an economical arrangement.

Power Plant.

In a repeater station current is to be provided for lamps, relays, transmitters and general purposes the same as in any common battery exchange, but nowhere near in such quantities. Therefore, this current may be obtained from two 12-volt batteries in series. The current for the above mentioned apparatus will hardly exceed 4 amperes for one hundred repeaters. The same battery may be used for heating the filaments, which require a current of 12 volts; this may be obtained from one of the two batteries, using the other one as a reserve. The battery is the A battery.

Of course we are talking here of a 22-type repeater. The tubes may be of different types, they may have metal filaments or oxyd coated filaments, the

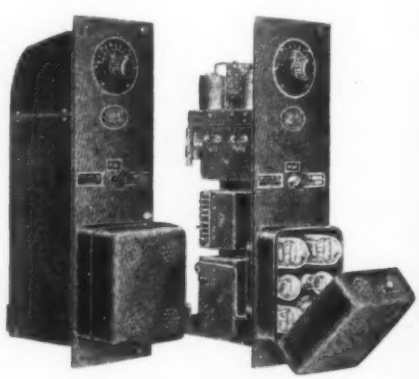


Fig. 4

heating voltage differs accordingly; therefore our assumption of 6 volts for one tube may have to be changed.

The plate voltage may be 220 volts and can be obtained from a city lighting system of twice 220 volts, but this must be direct or continuous current (and not from a twice 110 volt system), or from a battery. The grid voltage may be taken as—6 volts and may be supplied from 3 small storage cells.

The ringing generator proposition is depending on the method of ringing. Lately "voice frequency" ringing at 1,000 cycles has been introduced; 135 cycles is used for ringing over composited toll lines. The ringing machines required for a repeater station are small but rather complicated, but not necessarily more so than the ringing machines of a common battery exchange which have to perform various functions.

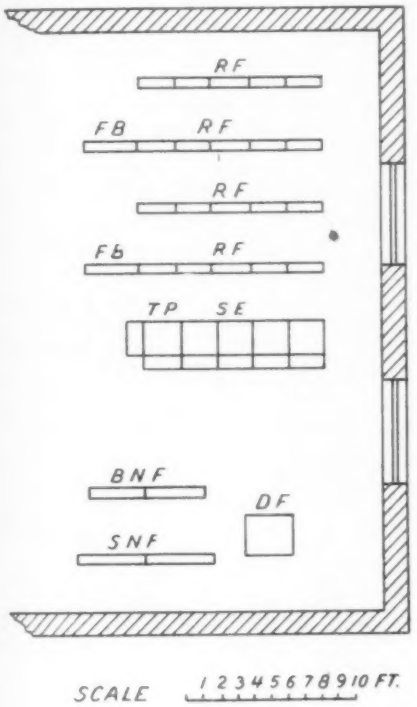


Figure 5

As a whole a power plant for a repeater station does not involve any radically different problems from a power plant for a common battery exchange and will, therefore, not be discussed any further. The only new item may be the voice frequency ringing. This will be explained in detail at some future time in a discussion of submarine cable telephony, in particular in connection with the Key West-Havana cables.

Cord Circuit Repeaters.

It had been mentioned before that cord circuit repeaters were used where lines had to be connected which varied in their characteristics. This pertains particularly to the attenuation. Through-line repeaters are permanently connected in fixed lines which of course retain always the same attenuation loss, which has to be made up by the repeater. When, however, an operator has to make connections to different lines which have different characteristics, and thus produce different attenuation losses, she must be provided with repeaters, etc., that enable her to adjust the two toll lines to be connected together so as to keep the attenuation in such limits that satisfactory conversation can be carried on.

The jack and cords, also previously mentioned, are assembled together with the usual operator's equipment of signals, keys and talking circuit in a switchboard section corresponding in structure to a regular toll board section. The repeater units, the balancing networks and any supplementary networks are located in this instance also upon separate frames; all of which does not require further elucidation.

In the jackpanel each toll or long distance line is represented by a jack and under this toll line jack is located the jack to which the balancing network simulating the toll line is connected. Not all toll lines terminating in the toll board must necessarily be represented in the repeater section, but only such toll lines as require amplification. There are required as many pairs of plugs as there are repeaters. Consequently there must be twice as many repeater jacks as there are repeaters, and also twice as many signal lamps coordinated with the repeater jacks.

Associated with each repeater cord circuit are supervisory lamps multipled in the regular toll operator's positions so as to leave the entire supervision of the toll call in the hands of the toll operators at the positions where the toll calls are handled regularly. The repeater section operator makes only connections at the bidding of the regular toll operator and disconnects again when she receives her disconnect signal.

The method of operation of repeater cord circuit calls is the following: As soon as the operator at the toll board receives a call over a long line for another long line she gets into communication with the toll operator, in front of whom the called-for long line, which needs the repeater, terminates. This latter toll operator switches the called-for line over, by means of a key to the repeater board section. The first toll operator also operates a key associated with the calling toll line and instructs the repeater section operator to connect the repeater in circuit. At each of the two toll board positions the lamps associated with the toll jacks of the calling and called for line respectively, will light, but are extinguished as soon as the operator at the repeater section inserts the plugs of the cord circuit containing the repeater, thereby notifying the toll operators that the repeater is connected in. The repeater section operator, when connecting to the extended toll lines, simultaneously connects in the balancing networks, which affects the repeater unit in so far as it permits battery to flow through the filaments whereby the latter are heated. The repeater section operator assures herself of the fact that the filaments are heated and the tubes in operation, by a lamp lighting. Wherever a tube is held in reserve to be put in service automatically in case the first tube is disabled, another lamp is provided which will indicate to the repeater section operator whenever such an incidental change in tubes takes place.

The filaments, as soon as conversation is terminated, become cold again, caused by the removal of the repeater cord circuit plugs; whereupon the signal lamps associated with the toll line jacks at the toll board are lighted again. The toll operators then disconnect and normal condition is established.

[EDITOR'S NOTE: This is the last installment of the series of articles by Mr. Dommerque. If you have profited by these articles and would like to have another series on another subject, please write us, indicating upon what subject you would prefer him to write.]

C. L. Jones Addresses Kiwanis Club at Caldwell, Ohio

Dr. C. L. Jones, of the Athens Home Telephone company, Athens, Ohio, accepted an invitation from the Kiwanis club of Caldwell, Ohio, to address that body Tuesday, November 21, and of course his talk concerned the telephone business. Speaking from thirty years' experience in the telephone field, Dr. Jones is able to talk as one having authority.

He reviewed the growth of the Athens company since the infancy of telephony, pictured its growth step by step until the present time when his exchange is transformed into an automatic station from the crude board in his dental office some thirty years ago.

Dr. Jones emphasized the necessity of cooperation between the company and the exchange for better service, and the need for adequate rates from which the property must be maintained in a way to insure that service which the public has become accustomed to.

The address was so complete and instructive that we are filing it away for reproduction at a later date. Much information is contained in the address.

Telephone service has recently been made available between all parts of Belgium and the entire country of Sweden.

BUILDERS of the TELEPHONE INDUSTRY

Many, many instances can be cited where outstanding characters in the industrial field started their business careers in a certain line of endeavor, only to switch over, in later years, to an entirely new field of endeavor, in which they ultimately became leaders in their new chosen profession.

Among the pioneers in the Independent telephone field we have "Doc" C. L. Jones, general manager of the Athens Home Telephone Company, of Athens, Ohio.

"Doc," as he likes to be called, was born at Athens, Ohio, August 23rd, 1870, to the late Rush A. and Celestia Jones. His father being a pharmacist, it was only natural that the parents desire for their son should lie along the lines of a professional career. With that thought in mind, "Doc" spent his early years in the schools of Albany and Parkersburg with some five years at the Ohio University, Athens, preparatory to receiving a dental degree at the University of Maryland, and a year's engineering course at the Rose Polytechnic Institute, Terre Haute, Indiana.

Returning to Athens, "Doc" opened up an office and nailed up his shingle as a D. D. S. and very soon was engaged in building up a lucrative practice. And while he had prepared himself to grace the professional sphere, these plans were forced into the background because of the rapid growth and development of the telephone communication lines with which he had become interested in the meantime.

In his professional work his clientele became larger and larger and in this way "Doc" sensed the need for improved communication facilities, and in association with George Dains of Vinton County, "Doc" succeeded in bringing a new toll station to Athens, connecting that town with some of the neighboring communities.

In the beginning of their operations this toll station was located in "Doc's" dental office, all calls being answered by himself personally. The popularity of the new arrangement was instantaneous, so much so that "Doc" with his associates which now included Dr. A. F. Holmes, Mr. W. E. Moler, and Mr. G. W. Duffee, decided that the thing to do now was to organize a real telephone company to take over the business that was experiencing so many growing pains and, furthermore, threatened to engulf a promising dental practice.

Dr. C. L. Jones, Athens, Ohio

Accordingly, "Doc" and his friends called upon the officers of the neighboring company at McArthur, Ohio, which had built a few lines into Athens County, and advised these gentlemen of their intention to build up a county-wide telephone system in Athens County. Negotiations were entered into whereby they purchased the competing lines within the local territory. Quarters for the new exchange were rented in one of Athens business blocks and a switchboard with a capacity of 20 lines was purchased and installed, an operator was engaged, and the Athens County Home Telephone Company was formally launched upon its career.

In about sixty days after opening the new exchange, the original switchboard was overtaxed and found inadequate. Another board with a capacity of 30 lines was purchased—but soon, even this board, with the large capacity of 30 lines was outgrown and had to be replaced with a still larger board. This growth continued for months, in fact, "Doc" soon discovered that the telephone business was engaging more and more of his time and attention very much to the detriment of his dental practice. Time that would ordinarily be devoted by a practicing dentist to office work, was consumed in the search for money with which to carry on extensions and improvements; in supervising the installation of plant; and in attending to the multitude of duties that follow the manager of a telephone system.

Finally in 1909 the telephone system boasted of some 1000 telephones and "Doc" had to bow his head to the inevitable. He bade farewell to the dental profession and moved the telephone exchange into a new two-story brick building upon the main street of Athens. Here is installed their first common battery exchange, and here began the consistent growth that has brought the Athens Company to the front as one of the foremost industries in the section in which it operates.

During the current year, the Athens Home Telephone Company was again experiencing growing pains, and "Doc" was busily engaged in supervising the construction of a new brick and concrete, fireproof central office, which was completed and thrown open to the public at midnight on August 18th last. The new building is among the largest and most modern structures in his Home City. The cost of the new building was approximately $75,000 and new automatic telephone apparatus was installed costing another $75,000. A total new investment of $150,000 having been made. The company serves more than 3500 subscribers, including subscribers connected with the outlying offices at Albany, Amesville, Chauncy and the Plains.

And yet, notwithstanding, the demands of time upon his energies in putting over his new chosen work "Doc's" interest in the telephone field had not been entirely spent upon the affairs and properties of the Athens Home Telephone Company. For more than a quarter of a century he has been an active member of the Board of Directors of the Ohio Independent Telephone Association, of which he was President during 1926 and 1927. He has also been a member of the Board of Directors of the United States Independent Telephone Association since 1923 and has been active in the affairs of the Independent Pioneers for many years. He is, likewise, a participant and leader in civic and municipal affairs, the Athens Rotary Club—The Elks—and County Club, as well as many other local and state organizations.

"Progressive" Illinois Telephone Convention Wide-Awake Event

The "Progressive" convention of the Illinois Telephone Association held Thursday and Friday, November 8 and 9, at the Hotel Abraham Lincoln, Springfield, Illinois, lived up to its name Progressive in every way, and broke all previous records for attendance and enthusiasm.

The attendance was above that of last year, being almost 600 registered delegates and guests. The general sessions were held in the grand ball room and the traffic conferences were held in the Palm room. Both executive and traffic meetings were unusually well attended.

The most outstanding addresses of the convention were those of the president of the Illinois Association, Mr. George X. Cannon, the Hon. William H. Malone, Ben B. Boynton, V. Y. Dallman, J. Howard Mathews and R. D. Wallace. The discussion of the strength of guy wires and consideration to be given to the distance of anchor from pole was illustrated by means of an original miniature model of a section of a telephone line by Mr. Mathews, assistant chief engineer of the Illinois Commerce Commission. This paper was intensely interesting and practical.

The election of 15 directors on Friday morning resulted in the selection of T. C. Ainsworth, Bloomington; W. H. Bassett, O'Fallon; A. R. Bone, Chicago; George X. Cannon, Freeport; E. D. Glandon, Pittsfield; Dr. R. E. Gordon, El Paso; H. G. Lankford, Chicago; R. A. Lumpkin, Mattoon; R. M. Matteson, Joliet; A. J. Parsons, Murphysboro; A. R. Patterson, Streator; Louis Pitcher, Dixon; R. G. Raadstrum, Galesburg; E. S. Slusher, Macomb, and Earl Stice of Altamont.

At a meeting of the board of directors held at noon Friday the following officers were elected: Mr. Louis Pitcher, Dixon, president of the association; Mr. H. G. Lankford, Chicago, first vice-president, and Mr. A. J. Parsons, Murphysboro, second vice-president.

The Opening Session

Following the call to order of the general session on Thursday morning by President George X. Cannon, invocation was delivered by Walter R. Cremeans, D. D., of Springfield.

The annual address of the president, Mr. George X. Cannon, Freeport, was in effect a summary of the past year's record in Illinois of the telephone industry. Such topics as cooperation, legislature and service departments of the Association were covered thoroughly and in a pleasing manner.

One of the most outstanding addresses of the meeting was given by the General Counsel of the Association, Mr. Ben B. Boynton. In his annual report Mr. Boynton touched upon the rate schedules of telephone companies, rules and regulations of the Illinois Commerce Commission and offered many practical suggestions for the elimination of existing evils and the betterment of the rate structure in general. The paper read by Mr. Boynton was considered of such importance that a bulletin will be issued and distributed embracing the suggestions that were made in the discussion.

Report of Secretary-Treasurer Mitchell

Following the President's annual address, the report of the secretary-treasurer, Mr. Jay G. Mitchell, was presented. This report covered many of the high spots of the Association's activities during the past year.

The next speaker on the program was a well-known newspaper editor and publisher, Mr. V. Y. Dallman, who has a reputation throughout the state and country as a humorist and public speaker. His talk was very entertaining and amusing. In the latter part of his talk he grew serious as he gave specific illustrations of how he relied on the telephone service during the compilation of the results during the recent national election.

Closing his talk, Mr. Dallman used the following:

As I say, I amuse myself writing jingles, so this morning in a great hurry I knocked this one off:

"Why! Hello, Central! Hello, men!
We're glad to see you here again!

"The merry bells you ring for us
May make us smile or make us cuss,

"But well we know in shop and home
We always need the telephone!

"How could we 'visit,' gossip, buzz
Without the phone? It couldn't was!

"The world's poetic, rhythmic song
Is 'Central! Central!' all day long!

"Without the handy telephone
We couldn't broadcast laugh or moan!

"What greater nightmare could we dread
Than if the telephones went dead!

"Fire! Pestilence! Despair!
Would spread disaster everywhere!

"The merry bells you ring so gay
We echo from our hearts today!

"So! Hello, Central! Hello, men!
Springfield is glad you're here again!"

Mr. R. E. Myers, chief chemist of the International Creosoting and Construction Company, Galveston, Texas, next gave an illustrated lecture on preservation of pine poles. Two short reels of moving pictures were followed by a brief description of the treating processes and the service characteristics of the poles themselves.

Mr. Harry M. Slater, head of the rate department of the Illinois Commerce Commission, spoke in place of Hon. P. H. Moynihan, Chairman of the Illinois Commerce Commission. Mr. Slater's message was one of cooperation between the telephone interests and the state regulatory body in their desire to efficiently and fairly and honestly serve the public of Illinois.

The next speaker brought a message of general information from a perspective viewpoint, extending throughout all sections of the country. Mr. F. B. MacKinnon, president of the United States Independent Telephone Association, spoke at length on the National Situation of the Telephone Industry.

The Friday morning session was conducted on informal discussion lines from this point on. The program consisted of ten topics which related to plant construction, design and maintenance. Mr. R. D. Wallace, Division Plant Superintendent, Illinois Bell Telephone, read a very interesting paper on the Value of Routine Inspection of Subscribers' Stations. Mr. Walter G. Knowles, Clinton, spoke on the value of transmission maintenance, especially as it related to the effect on toll revenue. Mr. J. Howard Mathews gave a very interesting lecture with an original model designed to bring out the importance of guy wire strength and the location of anchors. This article will appear more in detail in a later issue of TELEPHONE ENGINEER. Mr. O. G. Woods, Jacksonville, read a very complete paper dealing with the necessity of traffic studies and force adjustment in the smaller exchanges. Others who appeared and took part in the discussion were: Mr. Walter J. Gallon, president, Wisconsin State Telephone Association, Antigo, Wis., Mr. A. R. Patterson, Mr. Walter G. Printy, Mr. F. A. Norris and Mr. E. D. Glandon.

The official souvenir of the convention was the eighth annual edition of the Telephone Construction Handbook. One-third of the book was given over to a synopsis of Rules for Overhead Construction from General Order 115 of the Illinois Commerce Commission. The handbook was attractively bound and was edited by a member of the technical staff of the Association.

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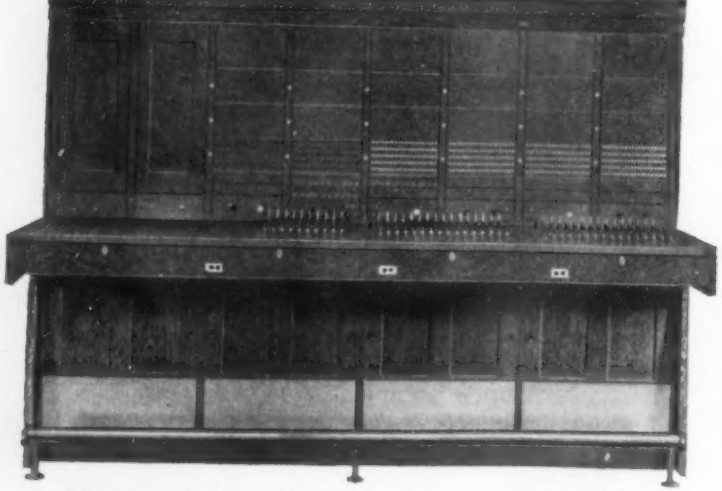
30-line P. B. X.

Monotype Convertible
400-line magneto convertible line at a time to common battery



Monotype Senior—Unit position common battery multiple

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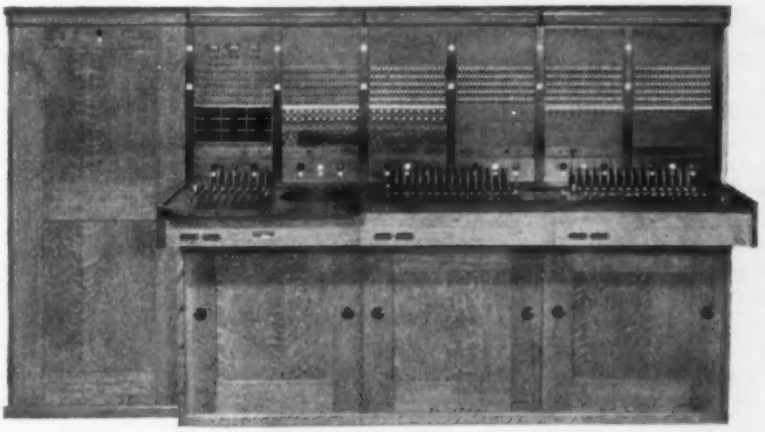
Monotype P. B. X. 80
80-line P. B. X.

Monotype 150 M
50 to 150-line magneto



Monotype Junior—600 line common battery multiple

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Trend of Program Service

Talk Given by H. T. McCaig Before the United States Ind. Tel. Association, October 19, 1928

Our telephone friends will remember the more or less successful attempts made by telephone companies back in the days before radio became popular to give program service by means of the phonograph. These systems usually were arranged so that when a telephone subscriber called for this service he was connected to a line circuit equipped with a telephone before which a phonograph was playing. By this method, the general public probably had its first glimpse of commercial "program service."

Then, of course, we all remember the advent of KDKA and the first broadcasting stations. The first receivers were equipped with head sets. This arrangement soon led to duplicate and multiple head sets so that more than one member of the family might listen to the program, something like one glass of soda with several straws. In this small beginning, however, we probably find the nucleus of our present program service systems.

But it was only with the development of vacuum tubes and loud speakers, that men with vision began seeing the possibilities of delivering programs by wire to large groups of patrons.

Considerable research work was done by many individuals in various fields, but it is of interest to note that nearly everything of practical value has been developed through the initiative and genius of telephone men.

Development has progressed principally along two lines. In one system high frequency carrier currents are employed to saturate a wire network. Each carrier current is modulated with a program so that several programs are simultaneously sent out for selection by the program service subscribers. When a telephone cable plant is thus saturated, each wire becomes a potential antenna. This system calls for the installation of a receiver at the subscriber's station capable of detecting and amplifying the programs impressed on the wire network through the modulation of the carrier frequencies. Usually two stages of audio amplification are necessary to bring the programs through at good loud speaker volume.

This system is the outgrowth of Gen. Squire's earlier idea of using carrier current for multiplex telephony. The possibilities of such a system were called to the attention of an official of the United States Independent Telephone Association early in the progress of Gen. Squire's experiments with carrier currents. This official in turn brought the matter before leading independent telephone manufacturers who began rather exhaustive experimental work.

The possibilities of carrier current program service cannot be ignored; on the other hand it is found that there are several factors involved in its operation which preclude its immediate adoption in favor of any other system. With such a system a number of programs may of course be transmitted simultaneously over a given pair of wires and in fact this pair of wires may be the same one which is providing commercial telephone service to one or more telephone subscribers. Properly designed, installed, and maintained, this multiple program service may be supplied over the telephone circuit without interfering with either the signalling or transmission properties of the telephone circuit. The central office equipment for the propagation of carrier current program service is obviously more complex and therefore more expensive than that required in connection with single-channel purely-audio program service work. The subscribers' station equipment is also more complex, requiring not only a loud speaker but in addition a tuning, detecting, and amplifying equipment equivalent to the modern radio receiver less its radio frequency amplifying apparatus. In the subscriber's station equipment the tuning devices should be arranged to quickly land on fixed high frequency channels, each such fixed adjustment being the carrier for one of the available programs.

One outstanding requirement of a carrier current program service system is that it shall in no way interfere with present or proposed long distance carrier current frequencies. This suggests the early adaption of standard frequencies for the exclusive use of program service systems.

It is our understanding that a multichannel carrier current installation has been made and given rather careful study with a view to determining the effect in actual operation of some of the points discussed in the foregoing paragraphs. Possibly we shall hear more concerning it during this session.

At recurrent intervals we hear quite a bit about the application of carrier current program service systems to electric light and power wiring so that programs may be obtained from the electric light socket. Power wiring has many natural physical obstacles and barriers which are not easy to overcome. Power networks are arranged primarily with other considerations paramount rather than that of transmitting speech, while telephone circuits and in fact all the elements of the entire telephone plant are engineered with the object in view of providing the very best transmission possibilities. Shifting loads and other manifold changing characteristics in power circuits bring about complete changes in the wire networks so that the problem of always having available efficient program service channels is made much more difficult than is ever the case in a telephone plant.

The system which has met with more nearly universal favor is the purely audio method of program distribution. This system follows the same trend as telephone development because audio frequencies only are used in the dissemination of programs. In the audio system amplifiers of sufficient capacity and of correct design are placed at a central location from which the program is impressed upon the cable pairs selected. All that is necessary at the subscriber's station is a loud speaker and volume control. The engineering back of this audio frequency system took advantage of valuable lessons learned in the development of the toll line repeater, linking of radio to wire lines, the general laws of applied telephony, all rendered first aid

Assistant Manager, Stromberg-Carlson Telephone Mfg. Co., Chicago Office.

A. B. Chance, Jr., Killed in Automobile Accident

A. B. Chance, Jr., of Centralia, Mo., was instantly killed in an automobile accident a few miles east of Centralia on the night of November 18th. The accident occurred when Mr. Chance met a Ford truck head-on while driving a Cadillac touring car. In the collision the car driven by Mr. Chance struck the Ford, blowing out a tire on his car and causing it to roll over on him. He was dead when removed from the wreck. Funeral services were held in Centralia November 20.

Mr. Chance is a son of A. B. Chance, Sr., of Centralia, Mo., owner of the Chance Manufacturing Company, and was actively engaged with his father in the offices of that firm. He was advertising and assistant manager of the organization. Telegrams were received from scores of friends throughout the country extending sympathy to the family.

in the developing of correct designs and in determining proper manufacturing operations.

By engineering forecast and by experience in the operating field it has been learned that the grouping of ordinary audio amplifying transformers and commercial loud speakers will not produce a satisfactory program service system. The amplifiers and loud speakers must be of special design to meet circuit and load requirements, to give ample, undistorted volume and to prevent objectionable cross talk to the telephone conductors of the cable plant.

The trend in program service during the past year has been toward developing refinements in the systems already designed rather than the entry into the field of anything radically new. These refinements have been along both service and equipment lines.

Most operating companies have consistently been raising the quality of the programs they produce and giving a more reliable, uninterrupted, service to their patrons. This has sometimes entailed considerable additional expense but the thought behind it all has been to keep abreast of the times—or to step somewhat beyond.

The three principal sources from which programs are derived are: from the air by means of radio receivers, from phonograph records by means of magnetic pickups, and from original productions such as orchestras, church programs, athletic events, studio selections, and the like by means of microphones. To secure the best from these three sources we find program service companies particularly watchful. If the source of program supply is not excellent the whole system is affected. Thus only the highest grade of receivers are used to reproduce the programs secured from the air. Attention is paid to the ability of the set to reproduce faithfully over the entire range of audible frequencies, instead of relying on mediocre outfits. Most companies employ duplicate receiving units so that the chances for service interruptions are lessened. These sets may also be arranged to operate from two sources of power supply so as to guard against failure on account of interruption of either.

To secure the best results quite a little attention may well be given to carefully selecting the site of the program pickup station where programs are being taken from the air by the radio receiver. The pickup location used for this purpose should be away from local disturbing noises of all kinds, including man-made static and should be in that locality in a given community recognized as being a "good receiving" spot.

In order to give variety and the thrill of something novel, frequently the short wave receiver is employed to pick up the short wave broadcasting of certain well-known stations or occasionally a foreign station. The short wave set also is helpful in providing programs, when electrical interference makes the regular broadcast band reception noisy or inaudible. The disadvantage of the use of the short wave receiver is the tendency of the short wave signal to fade. The fading on short wave reception is so pronounced that it is seldom used where dependable uninterrupted communication is necessary from point to point.

In phonograph reproduction electrically driven turntables guard against changes of speed, the magnetic pickups are carefully selected for faithful reproduction and all records used are electrically cut and fresh. Often records may be secured without cost by an agreement with a local music house, the advertising and the additional business the house secures is ample payment. Careful selection of record programs enhances the value of the service. For instance, an announcement of a Victor Herbert half hour or a classical program always has its group of admirers. The day's program must be varied to meet the demands of the general public. A very good guide in arranging program layouts is comment from the listeners.

Picking up of church events, local orchestras, public addresses, athletic events, etc., now receives much more study than was manifested when program service systems first served the public. High grade microphones are employed and much attention is given to the microphone amplifier construction. Expert engineers of broadcast stations are called upon to give advice and help in the design of reliable equipment, so that the best effects for the whole system are thus procurable. Acoustical engineers are consulted in the construction of studios, placing of microphones, and studio routine.

The modern program service company no longer is content to provide its patrons with a poor grade of reproducer. If the loud speaker is mute at high or low frequencies there is no chance to provide quality, regardless of the manner in which the program is sent out from the central point. A poor loud speaker may produce jazz music in a manner fairly satisfactory to most listeners because the faults in reproduction are readily attributable to the effects expected from the orchestral rendition. However, when a male quartet, a qualified soloist, or a speaker comes before the microphone a poor reproducer will cause the listener to call upon his imagination to supply the true harmonies which he expectes or to strain his aural senses to understand the spoken words.

Operating companies are giving marked attention to their central office plant and are ever on the alert for improvement. For instance, sources of current supply are being duplicated, more dependable machines for production of current supply are sought and new designs studied. Full A. C. operation for the smaller systems has been realized to some extent and will be more evident in the future. Development in this field is now in an active stage.

The foregoing treats of the physical trend as we see it, but there is another phase of the subject which possibly has more significance to the telephone man. In program service there is offered for the first time a real opportunity for telephone people to secure additional revenue through the use of their outside plant construction. Other public utilities have from time to time had their business stimulated by new inventions or innovations, while telephone people have been confined to practically one source of revenue. Therefore, when program service first made its appearance, many telephone people saw in it the means of providing another service to their communities.

And who are better fitted to enter this field? The whole set up of a telephone plant is based on providing correct electrical transmission of sound. This applies not only to plant construction designed for this one purpose, but to the training of its personnel, engineering, construction, maintenance and public relation departments; all are trained to further the interests of an art in which this newer development naturally fits. For these reasons it is felt that telephone people are the logical people to handle any form of development which distributes sound by wire.

It is important when entering this field to give the subject considerable study. The pioneers in the telephone field passed through a period when new companies were being formed, in which sufficient value was not placed upon the service they rendered. This resulted in inadequate rates, plants operating at no profit and at length the natural result, which called for complete reorganization. This lesson should not be overlooked in the formation of program service companies. A careful estimate of probable operating costs, such as value of plant, maintenance, servicing, depreciation, taxes, royalties (both patent and program), all should be given consideration, before a definite rate is fixed. Another point should also be given real thought. It is possible to give a *form* of program service with relatively small investment, but this invariably results in poor quality. It takes a definite amount of power to operate a good loud speaker and there is little use in attempting to supply the requirements with only a vivid imagination. A little money spent in correct engineering followed by the installation of properly designed apparatus of ample capacity quite generally insures satisfactory returns.

In program service there is also realized another ideal condition from a telephone man's standpoint. Here is an opportunity to serve the public in a new way and in a manner from which it derives definite pleasure. As a promotor of good will and cordial relations it has no equal.

The larger companies are giving program service a range of application circumscribed only by the extent of their physical telephone plant.

For instance, there is no hesitancy in the establishment of branch offices. Systems corresponding to the P. B. X.'s of the regular telephone layout type are installed in hospitals, hotels, apartment houses, schools, etc., while in some instances even the smaller adjoining towns are served. Thus, as the scope of the organization is broadened, there is built up a structure of permanency. In serving institutions, such as those just mentioned, telephone men should be especially interested. If program systems are installed by a local contractor without supervision, there is every chance that the apparatus might be installed in such manner as to interfere with the telephone service of the institution. Especially would there be danger of introducing cross-talk through faulty design, and improper installation methods. Most institutions will at once see the advantage of having their service supervised by competent men in the employ of a permanent public utility. There is a value, too, in having always available well maintained loud speakers instead of a poorly maintained private receiver. This is somewhat comparable to the P. B. X. situation. Very generally the telephone company P. B. X. is found to be more satisfactory in commercial institutions than is the privately owned P. B. X. even though the latter be manufactured in the same factory as the former and be equipped with the same satisfactory circuits and apparatus.

Persons engaged in the sponsoring, development and organization of new projects generally become very enthusiastic over them. In fact, such enthusiasm is in a great degree responsible for the success of the undertaking. Hence we may feel inclined to pardon the program service enthusiasts when they peer into the future and see there the realization of some of their dreams. If we are permitted to join them we find them visualizing such developments as these:

The establishment of large central studios connected by wire lines to distributing points of local program service companies—the local program service companies contracting for one or more programs.

The establishment of commissions to determine the quality of service rendered, to consider rates and to further progress of the industry, or the legalized assumption of these prerogatives by existing regulatory commissions.

Laboratories working to promote development and to study technical and engineering details, which will be available to all.

The application of further inventions to the systems established, such as television, and a wide choice of programs.

Not the most enthusiastic, however, can see the full limits of the picture or the lengths to which this program service development may lead. The first pages of the book have been unfolded and enough is seen to prove that the field is fertile and ready for cultivation.

A. M. Ritchie of Northern Electric Company Presented With Salver

At an informal surprise gathering in the company's dining room at Montreal on Saturday morning, Nov. 17th, Alfred M. Ritchie, Operating Superintendent of the Northern Electric Company and Pioneer in the manufacture of telephone apparatus, was presented with a silver salver engraved with the signatures of over one hundred and fifty supervisors of various departments of which he is the chief, representing some fifteen hundred employees, in token of their esteem and in recognition of his fifty years of service with the company.

The presentation was made by the President, P. F. Sise, who remarked that it was both a pleasure and honor to be asked to make this presentation to one with so unique a connection with the development of the telephone. J. D. Hathaway, Vice-President, in his introduction remarked that whilst Mr. Ritchie was not father and mother of the telephone, he was at least brother and sister, having had so great a part in its development.

A. M. Ritchie

Mr. Ritchie commenced his telephone career in July, 1878, as an employee of Charles Williams, of Boston, who had constructed the first telephone for Alexander Graham Bell in 1876, and later manufactured telephones for the Bell Telephone Company. In 1884 Mr. Ritchie was transferred to Montreal to work with the Bell Telephone Company of Canada, which had then been inaugurated only a short time and whose manufacturing department was housed on an upper floor of the old Garth Building, now No. 22 Craig Street West.

The business grew rapidly and Mr. Ritchie advanced with it through several successive moves to larger quarters until he found himself with the company at the Aqueduct plant which had been built specially for them. When the manufacture of telephone apparatus was taken over by the Northern Electric and Manufacturing Company, Mr. Ritchie became a Northern employee, advancing with the new company to his present position in the plant at 121 Shearer Street.

Southwestern Division Convention at Hot Springs

The Executive Committee of the Southwestern Geographic Division, N. E. L. A. in its meeting November 9 at Dallas, Texas, decided to hold the 1929 convention of the division at Hot Springs, Ark., April 30 to May 3 inclusive. The convention headquarters and all sessions will be at the new Arlington Hotel and certain features of the program will be broadcasted over Station KTHS. The convention will be a joint convention of the Southwestern Division and the Arkansas Utilities Association with probability that it will include also some divisions of the Southwestern Public Service Association.

Oklahoma Telephone Co. to Improve Hominy Exchange

Hominy, Dec. —Improvements will soon be made to the telephone exchange of the Oklahoma Telephone Company here to cost approximately $2,000. These will include replacing of 710 feet of 50-pair cable with 100-pair cable and placing of 1310 feet of 50-pair cable to supplant the line now carrying 32 iron wires on crossarms. New poles will be set to carry the cable and distributing terminals will be placed along the cable as needed to serve the telephone users, according to S. B. Green, general manager. Material for the improvements is already on the ground. The company also plans rebuilding of rural lines and other improvements during the coming year.

Continuous Charging for Automatic Branch Exchange

By LEWIS EARL*

A vital problem in the engineering of private branch exchanges is to provide a power plant of comparative simplicity and low cost where the attendance and supervision required is a minimum and where the floor space taken up by the plant is small. The last requirement assumes considerable importance when it is considered that these private exchanges are frequently installed in office buildings where the annual rent per square foot of floor space is high.

To meet the problem of minimum attendance, two methods of charging are possible. One, used with the larger private branch exchanges, charges the battery automatically when it reaches a predetermined state of discharge. With an alternative method of charging equipment is connected to the battery continuously and so adjusted that at average load a small trickle charge only flows into the battery. At heavier loads the battery is discharging and at lighter loads it is being charged. As a result the battery never gets extensively discharged and at least once a week become substantially fully charged. This method is particularly suitable for the small private branch exchange, and equipment and circuits have been designed to make two sizes of power plant available: one which will handle up to two and one-half amperes and the other up to five amperes under maximum load conditions in the busy hour.

These small power plants are designed to operate on the local lighting circuits of either direct or alternating current. When the source is direct current a small motor-generator set is used for charging; and when it is alternating current Tungar rectifiers, which have proven so satisfactory for the ordinary radio batteries, are used. The radio type LXL storage battery is employed which also is standard for the larger private branch exchanges where automatic charging is used. Due to their production in large quantities and their wide distribution these batteries are relatively inexpensive and readily obtainable.

These continuous-charging power plants were designed principally for use with the dial system P. B. X. which requires a voltage maintained between forty-four and fifty volts. A battery of twenty-three cells was selected as being most suitable for this voltage range. As this battery might reach a voltage approximating fifty-eight volts when fully charged at a substantial rate, some form

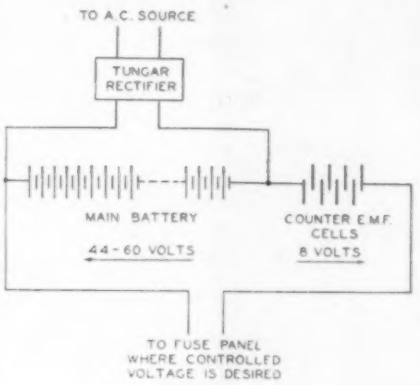


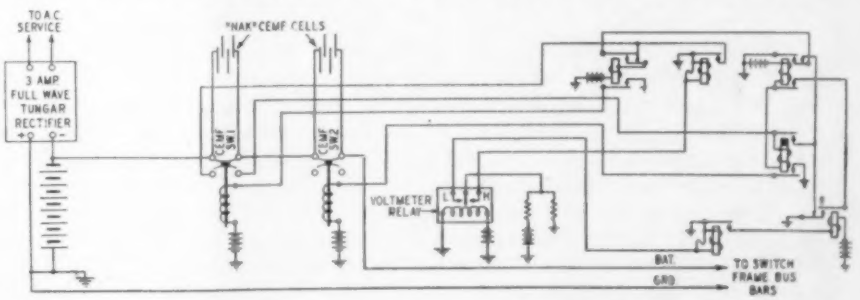
Diagram showing method of connecting counter-E.M.F. cells into circuit to control voltage

of regulation was necessary in order to meet the fifty-volt upper limit. Two groups of counter-EMF cells, each containing two cells, were used to provide the required voltage control. These counter-E.M.F. cells are connected in the discahrge lead from the battery and develop an electromotive force opposing that of the battery itself. The accompanying diagram shows how they are connected into the circuit to cut down the high battery voltage when necessary. Whenever they are not required, they are cut out of the circuit.

Counter-EMF cells are used to a considerable extent in telephone and telegraph power plants for voltage regulation, but the ones previously standard throughout the Bell System are of the lead-acid type. For this P. B. X. power plant, however, a newly-developed cell, known as the NAK, has been used. It has pure nickel electrodes in an alkaline solution. The superiority of the nickel-akaline cells is evidenced by their negligible electrochemical capacity as compared to the lead acid type, and also by their considerably longer life and reduced maintenance. Neither the lead nor nickel counter cells have active material and so neither should store a charge. Actually, however, the lead type is somewhat active electrochemically so that a small charge is stored. The negligible activity of the NAK type makes it possible to short-circuit them in order to cut them out of the circuit, which often simplifies the switching.

The introduction or removal of the counter-EMF cells from the discharge circuit is controlled by a voltmeter relay. When the fuse-panel voltage reaches fifty the voltmeter relay closes its "H" contact; and through a chain of relays the first counter-EMF cell switch is operated. This removes the short circuit from the first group of two counter-EMF cells whereupon the fuse-panel voltage drops below fifty and the voltmeter relay breaks the "H" contact. If, due to charging conditions, the voltage again reaches fifty, the voltmeter relay again closes its "H" contact and switch No. 2 is operated. This removes the short-circuit from the second group of cells, causing the voltage again to drop below fifty, after which the voltmeter again breaks its "H" contact.

When, due to increased load, the fuse-panel voltage drops to forty-four, the voltmeter relay closes its "L" contact and through the chain of relays switch No. 2 is operated and places a short circuit across the second group of cells. The voltage now rises above forty-four with the consequent opening of the voltmeter relay "L" contact. If the voltage should again drop to forty-four the voltmeter relay would of course again make on its "L" contact and, through the relay chain, switch No. 1 would be operated and a short circuit be placed across the first group of cells. Following this the volt-



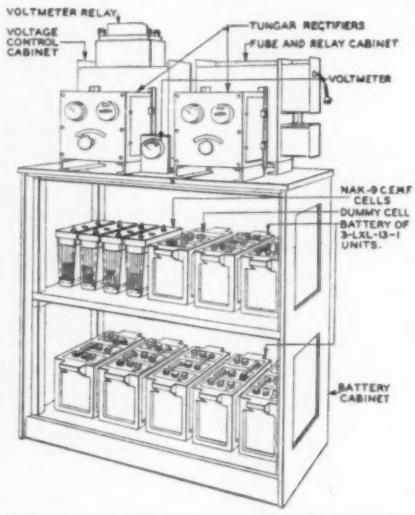
Circuit diagram showing method of cutting counter-E.M.F. cells in and out of circuit

*Abstract of an article in Bell Laboratories Record.

age would again rise above forty-four and break the voltmeter relay "L" contact.

The chain of relays is so arranged that any part of the above cycle of operation is possible. Switch No. 1, for example, may be operated and then released without operating switch No. 2. If load requirements are such as to require both switches to be operated or released switch No. 2 is always the second one to operate and the first to release. Where the voltage range to be maintained on the switchboard equipment is liberal, such as 20-28 volts, the voltage control equipment described is not required.

An accompanying illustration shows the power plant as it is arranged where alternating current service is furnished. It will be noted that the complete power plant is installed near the switch frame. Its comparative simplicity can be visualized, as it consists of only the charging sets with metal cabinets housing the voltage-control, fuse and relay equipment, separately mounted voltmeter and voltmeter relay, and a cabinet enclosing the twenty-three cell storage battery, the top of the cabinet acting as the foundation for all of the other power equipment. The voltmeter relay, on account of its sensitiveness to stray fields, is separately mounted on a wooden block on top of the voltage-control cabinet.



General arrangement of power plant where alternating current is available

Annual Convention of Missouri Telephone Association at Kansas City

Kansas City, Missouri, again was host to 320 visiting telephone men and women assembled there for the annual meeting of the Missouri Telephone Association at the Hotel President on November 13 and 14, 1928.

The meeting, one of the finest ever conducted by the Missouri Association, was rather a cosmopolitan gathering, including telephone representatives from the states of Illinois, Iowa, Nebraska, Indiana, Ohio, Oklahoma and Kansas, in addition to those from Missouri. Very lively interest was manifested throughout the convention by all from the opening address of welcome to the general business sessions at the close of the meeting.

The first business session opened at 1:30 Tuesday afternoon with President Houck McHenry presiding.

Owing to the inability of Professor William A. Irvin of Topeka, Kan., to be present, F. B. MacKinnon, president of the United States Independent Telephone Association, delivered an address on "Current Business Tendencies." Stressing the importance of maintaining a national independent organization, Mr. MacKinnon advocated local financing and economical operation of telephone properties. Foster McHenry, general superintendent of the Capital City Telephone Company, Jefferson City, Mo., paid a tribute to telephone employees generally for their loyalty to the industry and for the important part they are taking in the upbuilding of our country. He complimented the Bell laboratories and independent telephone manufacturing companies for their research work which is constantly bringing about improvements and greater efficiency in telephone service.

E. R. Stonaker of Rochester, N. Y., consulting engineer of the Stromberg-Carlson Telephone Manufacturing Company, presented a splendid lecture on traffic engineering as a guide to economical operation of telephone plants. Mr. Stonaker stated that while formerly traffic engineering received small consideration, today it has become most important and deserves the weightiest cooperation on the part of all branches of the industry. Mr. Stonaker amplified his address by charts and curves, proving mathematically the correlation between traffic loads and plant facilities.

The report of the secretary-treasurer, Robert W. Headrick, Jefferson City, Mo., indicated that the association during the year was engaged in many useful and beneficial activities for its members and the telephone industry as a whole. H. B. McMeal, original owner of Telephony, gave an interesting account of how this weekly telephone journal was started in 1899. He paid tribute to the untiring efforts and fine ability of Stanley Edwards, its present editor, for the splendid magazine which it is today.

An address "The Value of Cooperation Among Telephone Companies" by Jay G. Mitchell, Springfield, Ill., secretary of the Illinois Telephone Association, advocated standardization of operating practices, construction, maintenance and public relation methods for telephone companies; such cooperation between companies to be effected through the national and the respective state association activities.

The Wednesday morning session was devoted to an operators' school in group conferences conducted by E. F. Carter of Columbia, Mo., manager of the Columbia Telephone Company.

S. T. Neill, Clinton, Mo., and M. L. Golladay, Holden, Mo., pioneer telephone men, recalled humorous incidents and practices connected with personages prominent in the early telephone days in Missouri. L. M. Kraege of Topeka, secretary of the Kansas Association, and H. W. Hubenthal of Oklahoma City, Okla., briefly reviewed telephone conditions in their home states.

Tuesday evening was devoted to merrymaking when telephone people and invited guests attended the annual banquet featuring a musical entertainment and dance.

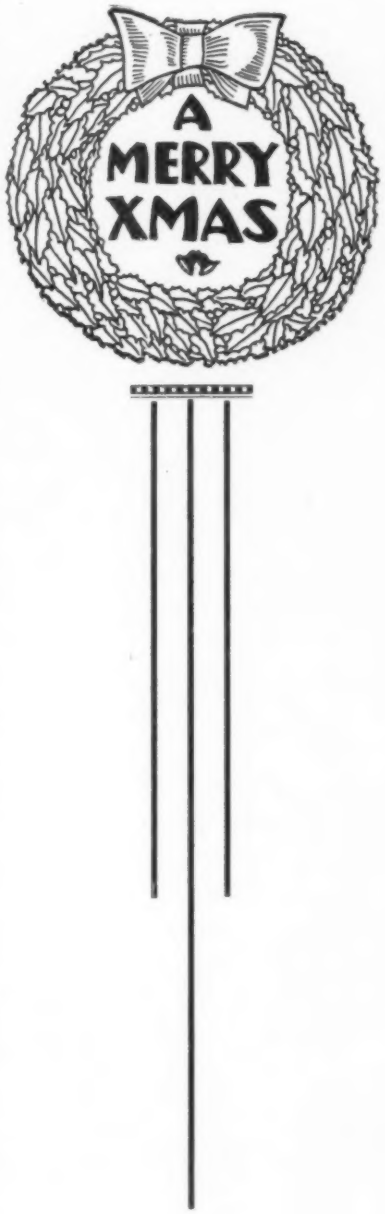
Twenty-one manufacturers and dealers in telephone equipment and supplies and representatives of three telephone magazine publishing companies afforded everyone interested an opportunity to get information, especially concerning the latest improvements and developments covering everything used and useful in the telephone industry.

President Houck McHenry and Secretary-Treasurer Robert W. Headrick, both of Jefferson City, Mo., were reelected for the coming year.

Manufacturers, Publishers, Material, Supply and Service Companies represented at the convention were:

Stromberg-Carlson Telephone Manufacturing Co., Kellogg Switchboard & Supply Company, The Chas. L. Ward Company, Automatic Electric, Inc., Addressograph Company, Cook Electric Company, Graybar Electric Company, Inc., Leich Electric Company, Page & Hill Company, Reliable Electric Company, Telephone System & Accounting Company, Sands Electric Company, American Electric Company, National Carbon Company, International Creosoting & Construction Co., Quick Directory Company, Suttle Equipment Company, Carbon Products Company, French Battery Company, Everstick Anchor Company, Kodel Electric & Manufacturing Co., Transmitter-Journal Publishing Co., Telephone Engineer, Telephony Publishing Co.

Season's Greetings



THIS is the season of the year which inspires us to think of the kinder, softer things of life—to review the past, revive determination not to repeat old mistakes,—and above all, fires us with a new faith, new courage and renewed vision to see progress and fulfillment in the future.

If, in our pursuit of happiness, we may seem to be concentrating greatly on income and business which, after all, are merely the tools of life—it is our intimate experience with the hard facts of daily existence which gives us such an absorbing and practical interest in these tangible necessities. But our business striving and growth has actually done much more than we can conceive of—it has set high standards for us in our relationship to our fellow men.

The standard of our business ethics today seems on a higher plane than more intimate personal relationships—where often broken faith and broken contracts seem the order of the day—a condition which would not be tolerated in trade and commerce. In commerce and finance, unsound ideas have been put over by sheer personality, by ability to turn a pretty phrase or clothe an idea in picturesque language are beginning to bore. Ordinary common sense and logic are taking their place.

This post-war readjustment period has taught wise men that the standard of selfishness creates only transitory success. We have learned that constructive building and corrective measures bring the best results—that evils in the existing orders have a way of correcting themselves in the course of evolution.

Business men are developing a greater tolerance and understanding of each other and of human motives—and are, therefore, better able to work together than in the past, when the innocence of inexperience and lack of education created continuous disturbance.

There is every sign that men are thinking harder than ever, and surely 1929 must show progress if we act wisely on the basis of our experience and our observation of cause and effect in this era of reconstruction through which we have been going.

To our thousands of friends, advertisers and readers we extend our most cordial felicitations of the season and trust that the new year will increase your prosperity and bring you an added measure of happiness.

TELEPHONE ENGINEER PUBLISHING COMPANY

By J. A. SMITH, President.

The Philosophy of Depreciation

By FRANK F. FOWLE
Consulting Engineer, Chicago

(*Continued from November*)

"It may not be improper to take for example a locomotive, consisting of some fifteen thousand parts, many of them duplicates and all of them replaceable, as illustrating the fallacy of the method of accounting now suggested. When a locomotive is received from its builder it has to be 'tuned up' and put in shape for service. Assuming this condition as 100 per cent, it is entirely practicable to keep the locomotive in service indefinitely by successive renewals of its parts. The ability of the locomotive to handle its rated tonnage remains unimpaired so long as 'wear and tear' and 'age and decay' are fully offset through the maintenance account. Nor is it at all certain that the units against which depreciation has been accrued, will pass out of service coincident with its being written down to its salvage value, as is necessarily assumed by the theory used by the Depreciation Section. As an example, consider the practice of the reconstruction of freight engines into switching engines, under which practice an engine that has already been in service many years is still expected to have a life at least as long as that already accounted for."

Another concept presented by Mr. Loree is the distinction between the wasting of assets by normal wear and tear on one hand, and by obsolescence and inadequacy on the other hand. In his testimony just referred to, he said further:

"To the definition of 'depreciation' as a wasting of assets, the Depreciation Section adds a further conception—'the decrease in the service value due to obsolescence, inadequacy, changes in the art, and public requirements.' The prime distinction between two sets of facts is that one has been incurred in the past and should be charged currently to the users during the period of their enjoyment, while the other is a substitution for an existing asset of a different and better asset, the enjoyment of which is to be had by users in the future, and, as is now done with the item 'abandoned property,' should be charged against such users. There is no justification for confusion caused by treating these entirely different matters in the same way under the same account as though they were the same thing."

A similar distinction has been urged by other authorities, namely, that when a retirement occurs by reason of obsolescence, for example, that portion of the wearing value already extinguished by ordinary wear or deterioration in service should be absorbed by the reserve, but the unextinguished part of the wearing value should be amortized over a future period because it benefits only the consumers who receive service after the retirement has been made. By this term "unextinguished wearing value," I mean the proportion of depreciable fixed capital represented by the normal remaining life in service which was lost, so to speak, because the retirement was made before the unit wore out physically. One method of handling such cases is to charge the appropriate portions of the retirements (for obsolescence or inadequacy) to an account known as abandoned property, under the general head of suspense, and amortize these balances over appropriate periods by charges to operating expense. Such accounting, however, seems to be uncommon in utility practice, except to absorb severe and unusual losses or casualties, and even then rather infrequently. Assuming for the sake of illustartion that this method of retirement accounting is sound in all instances where obsolescence and inadequacy are present, there arises a very practical difficulty in applying it according to any definite method, because the unextinguishable physical life will be very difficult to establish from experience, and in many if not most cases it will be an estimate. Moreover it would be necessary to apply this theory with considerable caution, and in the case of short average life there is a question whether anything would be gained by it at best. There is a further question whether tomorrow's consumers are not, after all, the same as yesterday's, especially where the development or use of the service is relatively high. If this is true, or nearly so, the method has relatively little to justify it.

Under the maintenance theory as advocated by the railroads, there is no reserve, either for retirements or for accrued depreciation. It is pertinent to inquire how, if a crtain amount of deterioration or accruing retirements are really existent in the property, the invested capital is fully protected. Apparently the answer to this query is found in the assumption that the profit and loss surplus serves this function, in addition to its other function of protecting the payment of interest and dividends in years of lean revenues and its general function of maintaining the financial credit of the enterprise. Where liberal expenditures are made from surplus for betterments and additions to the property, particularly in prosperous years, it is unquestionably possible to maintain the integrity of the invested capital, although it may be debatable whether the balance sheet can be accepted without adjustment as a complete disclosure of financial condition. Furthermore it may be debatable, for related reasons, whether the income statement can be accepted without adjustment.

Judging from various statements made by the respective advocates of these three different theories of safeguarding the investment from retirements of fixed capital, it would be inferred that these theories cannot be reconciled with each other, or at least they are not successfully interchangeable. But perhaps there are several clear and distinct reasons which differentiate these theories and tend to justify their differences. If we test them by the standard of the public interest in an enterprise devoted to public service, we may observe three important and fundamental requirements or obligations:

(1) To render adequate service of good quality.

(2) To render this service at the lowest rates consistent with such adequacy and quality.

(3) To maintain the financial credit of the enterprise at a level sufficient to attract the needed new capital on fair terms.

Everyone must admit that the respective advocates of these three theories of treating retirements can point to examples of conspicuously successful enterprises which tend to prove their respective contentions. That is to say, from the standpoint of credit and investment rating, there are numerous examples of telephone utilities, electric utilities and railroads which sustain the soundness of their respective theories, as developed and applied by their respective managements. But upon further analysis of these enterprises there are found some rather striking differences in the conditions of service, the expected life of the fixed capital, and fluctuations of revenue caused by cycles of business prosperity.

The railroads present the oldest class of enterprises here considered, with the longest record of accumulated experience in both the management of their physical properties and the direction of their financial policies. Much of the fixed capital in a typical railroad represents property such as land and roadway which does not inherently deteriorate with use, but may actually become more valuable with use. Other property such as bridges and buildings ordinarily has long life, on

Where working together is everything

An Advertisement of the
American Telephone and Telegraph Company

It is the aim of the Bell System that anyone anywhere in the country can pick up a telephone and talk to anyone anywhere else clearly and without delay. That is the meaning of universal service. To provide it, the means of telephoning must be uniformly good. Each of the 24 operating companies of the Bell System has full access to all the improvements and methods that are continually being made.

There are 5000 workers on the staffs of the American Telephone and Telegraph Company and the Bell Laboratories whose sole occupation is to develop constantly improving methods and equipment for the 350,000 employees of the Bell System to use in serving the public. The results of the efforts are evident, not only in the extension of telephone service across the Atlantic, but in the constantly improving local and long distance service at home.

The very nature of the telephone business necessitates a single interconnected system. The American Telephone and Telegraph Company accepts its responsibility for a nation-wide telephone service as a public trust.

It is fundamental in the policy of the Company that all earnings after regular dividends and a surplus for financial security be used to give more and better service to the public.

the order of 50 to 75 years. Motive power and rolling stock are different from other classes of property in the respect that deterioration tends to follow the amount of use rather than the lapse of time. Operating revenues and operating income also fluctuate materially with depression and expansion of general business, so that the maintenance of strong financial credit during periods of poor business demands temporary curtailment of expenditures, with abnormal expenditures during prosperous times in order to protect the property and the invested capital.

Possibly sight is sometimes lost of the fact that certain customary forms of railroad financing involve indirect provisions for property replacements or retirements of invested capital. For example, a sinking fund provision in connection with an issue of bonds is virtually a provision for retirement of some portion of the invested capital, and obviously it would be unnecessary and improper to make concurrent provision for retirement of both physical property and invested capital. That is to say, this would make twice the necessary provision for protection against wasting assets.

In another form of financing, often termed an equipment trust, the money to purchase equipment is raised by the sale of equipment trust certificates, the equipment itself is pledged to a trustee to secure the certificates, and a sinking-fund is provided to retire the whole issue of certificates in say 15 years or within the life expectancy of the equipment. Such a plan is obviously a substitute for the method of accrue depreciation, except that it expressly retires the invested capital, instead of the fixed capital or physical property.

Still another example might be cited, which is the situation represented by payment of rentals for the use of leased property. In this case the rentals may include an increment representing the accruing retirements of the physical property, which must be replaced or renewed from time to time by the owner or lessor. In some cases, however, the terms of the lease may impose the cost of maintenance and replacements on the lessee, and this expense may be treated as rentals, but in principle it is depreciation.

Even if the trend of much authoritative opinion today is toward the approval of reserves for protecting the invested capital against wasting assets, still it must be observed that a typical railroad is subject to certain conditions that distinguish it from public utilities, both as regards the composition of its physical property and the stability of its service demands and operating revenues. To say the least, there are strong reasons for flexibility in the provisions for depreciation, not only because of fluctuations in traffic, but in order not to unduly depress or swell the net income with fluctuations in general business levels, or increase the cyclic fluctuations in credit which now are unavoidable in some degree.

Telephone utilities came into existence considerably later than the railroads, but nevertheless have passed through the successive stages of promotion and pioneering, competition, rapid expansion and consolidation, and today are regarded on the whole as reasonably seasoned and matured enterprises. But growth still continues at a healthy rate, however, and advances in the art show few signs of abatement. Utilities of this class are characterized by rather stable revenues, partly or perhaps chiefly because a large proportion of the service is furnished under flat rates. They are characterized also by relatively shorter composite life of the fixed capital, in comparison with the expected life in power utilities of modern type, or in railroad experience. Critics of the theory of accrued depreciation—or accrued retirements, as one may term it—have protested that the reserves tend to become larger than necessary and are never used. If this criticism is justified it follows obviously that the operating expenses have been charged with more depreciation expense than can be justified.

We may observe that the only actual use ever made of the reserve is to absorb retirements, but it is always larger, under this theory, than needed for that purpose. In other words, in a mature property of stable age distribution the reserve tends to approach and remain at some constant ratio to the total fixed capital. However, if it be true that depreciation accrues in the fixed capital on a straight-line basis, or uniformly with the lapse of time over the life cycle, and the life cycle is correctly forecast, then it follows inevitably that the reserve is the correct amount to protect the full integrity of the invested capital. We may here observe that the reserve is essentially held in trust by the management for the benefit of the investors or owners of the business and is their property. It is not the property of the public or the consumers, and is not inherently for the purpose of making replacements. As a rule the assets represented by the reserve are invested in fixed capital, but not for the purpose of earning any return for the investors. It seems to follow that the function of a reserve larger than necessary to absorb and equalize the current retirements, and sufficiently large to cover the accrued depreciation in the fixed capital, is primarily to protect the investment.

These reserves have sometimes been criticized because of their size and perhaps in individual cases there was more or less justification. The reason for high reserves is likely to be found in high rates of depreciation, based on estimated useful life of property which was less than that realized. At best, the provision for annual depreciation is only a forecast, based on experience and modified if necessary by the prospects for the future. There is possibly more tendency to overestimate depreciation than underestimate it, but from the standpoint of the investor the error seems to be in his favor.

A collateral advantage of the straight-line theory is the availability of the whole annual provision for depreciation, or say 5 per cent, as a cash resource for replacements and additions to the property during the current period. This reduces the amount of annual financing which must be carried out by the sale of new securities, or temporary bank loans, or both. In other words, the total investment securities in the hands of the public are less than the total fixed capital plus net working capital by the total amount of reserve and the profit and loss surplus.

The electric power industry is today in the stage of rapid expansion, not only in the growing number of customers but also in the rapidly multiplying uses of electrical energy for saving labor and raising the standards of living. As a whole it is now passing through the stages of development which characterized the telephone industry about two decades ago. What was frequently true of telephone utilities then is often applicable in the power industry today, namely, that the building up of depreciation reserves on the straight-line theory would have exceeded by far the current needs for retirements and imposed a financial burden which the rates for service were insufficient to support without impairment of financial credit. Moreover the telephone industry at that period lacked any systematic accumulation of plant mortality experience from which to predict the life expectancy without large probable errors. Electric utilities are in much the same position today, with the difference, however, that the probable life expectancy of their fixed capital is materially greater than that of telephone utilities. When public utilities are in this position of very rapid expansion, it would appear more to the public interest that credit be unimpaired for the sake of securing new capital and expanding the service, than to enforce the adoption of depreciation accounting on the straight-line theory and thereby lower the credit of the utilities and retard development. Assuming that rates are only sufficient to permit a utility to absorb retirements through operating expenses during the period of rapid expansion, and that the probable life of the fixed capital is relatively long, the need for a somewhat flexible system of retirement accounting is rather obvious. This is predicated rather naturally on the prospects of still greater expansion and development of an indus-

Here,

Gentlemen of the Committee, is the answer of one industry

No. 4 of a series inspired by the report of the Secretary of Commerce's Committee on Elimination of Waste

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IN making the nation's telephones at Western Electric, the scales of productive capacity and demand are balanced to a degree rare in industry. This favorable condition is possible because Western Electric provides substantially all the equipment used by the Bell System.

That great organization, planning its development well into the future, lays down a schedule of its needs fully a year in advance. As a result manufacturing units function the year 'round at a pace closely predetermined. There is no expensive seasonal "rush" at one period, to be followed later by an equally costly period of idle equipment. There is no unnecessary storage of raw material against unexpected demand. There is no wasteful, over-night "breaking-in" of labor to sudden, unaccustomed tasks.

On the other hand, men, machines and materials are assigned and co-ordinated to meet known demand, employment is stabilized, and costs are maintained at a minimum. This is equally true of every ramification of this company's three-fold responsibility to the Bell System—in manufacturing, purchasing, distributing. Western Electric men are keeping the scales balanced.

Western Electric

Purchasers... Manufacturers.. Distributors

SINCE 1882 FOR THE BELL SYSTEM

try which is indispensable to our modern civilization.

Critics of the retirement theory of reserves only sufficient to equalize the annual retirements point out that the total fixed capital or property is all represented by invested capital, or substantially so, and that there is no reserve to protect the investment, in the event the valuation for rate making is esablished on the basis of cost new, less a deduction for depreciation. In that event the full fair return on the whole investment will obviously be impaired, to the extent that the rate base is actually less than the investment. The contrary view is that in such circumstances the proper theory of valuation is to accept the full investment as the rate base, assuming that the investment has been prudently made. Unfortunately there is no universal agreement today that either theory of valuation is the only proper and equitable one for use in regulation. On the theory that the prudent investment is the proper rate base, it is argued that reserves are not necessary. Under the other theory it can be argued that a reserve adequate to cover the deduction for depreciation is virtually imperative.

This states the case from both viewpoints of the theory of valution, but there are shades of opinion or judgment which in effect lie between the extreme of straight-line depreciation reserves on the one hand, and the opposite extreme of no reserves whatever. In a matured and successful property it is possible that the profit-and-loss surplus may be built up to the point where, in effect, it serves the function of a reserve to protect the investment, but in those circumstances it is also rather evident that the entire surplus is not properly available to protect the payments of interest and dividends in years of lean or deficient revenues (if such occur) unless the regulatory authorities hold to the investment theory of the rate base, as distinguished from the theory of cost new less depreciation.

In closing I wish to draw attention again to the fundamental differences in plant, service and revenue conditions which sharply distinguish telephone utilities, electric utilities and railroads from one another, not only as of any given time, but also at different stages of their growth and development. Perhaps in these differences may be found the justification for applying different theories of depreciation, in order best to serve the interests of the public and the investors under all the circumstances at any given period.

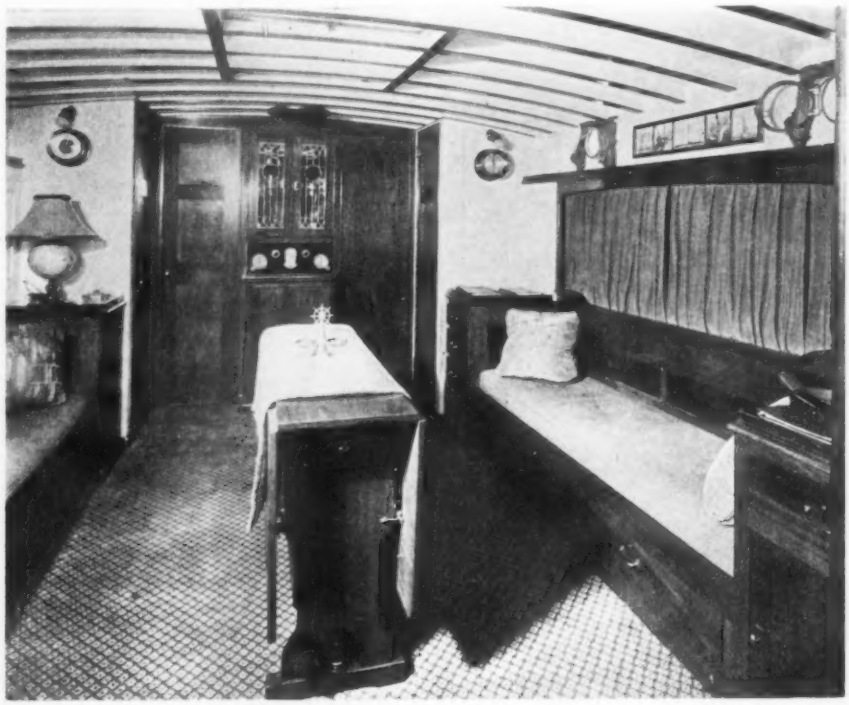
Of the total of about 31,000,000 telephones in the world, approximately 25,000,000, or 80 per cent, can be connected with the Bell System.

Stromberg-Carlson Fit Out Walter Todd Yacht with Radio

Inasmuch as a yacht is a home on the water, it is not hard to understand how the radio receiver has enjoyed an ever-increasing popularity as a part of yacht furnishings. Boats that are large enough to erect a good antenna, as a rule, are provided with exceptionally fine entertainment, inasmuch as there are no obstructions to shield the radio waves, and in sailing vessels there is none of the electrical disturbance which often makes reception difficult for the city dweller. The Stromberg-Carlson Telephone Manufacturing Company has made more than the ordinary number of such marine installations.

One of the newest is that which has been made in the 68-foot yacht of Walter Todd of Rochester, New York. Mr. Todd is Vice-President and General Manager of the Todd Company of Rochester, known the world over as manufacturers of Todd protectographs and safety check paper. The yacht has accommodations for ten people, a crew of three and seven passengers. The Onaire II, as the yacht has been christened, is equipped with a Stromberg-Carlson No. 633 receiver and phonograph equipment from our Stromberg-Carlson No. 744 instrument in order that both radio and record reproduction may be had. Space, of course, is always limited in a yacht, and everything must be made immovable in order that rough weather will not disturb the interior of the cabin. Consequently, the receiving set was built into the wall of the cabin, as shown in the illustration. The loud speaker is mounted with its face downward from the ceiling. The phonograph equipment is built into the other corner of the cabin, the wire from the magnetic pick-up running beneath the floor to the receiving set to give phonograph records electrical reproduction.

The receiving set is battery operated, and runs off the yacht's power plant. Being a sailing vessel, there is no motor noise to disturb radio reception, while the yacht is in motion. There are two keys on the radio, one connecting it with the phonograph and the other cutting in a loud speaker, located on deck. A rather ingenious antenna arrangement has been made. The ordinary horizontal antenna, or one strung from the tops of the mast would be impracticable, inasmuch as sails are raised and lowered, and the wind causes the spars to sway back and forth. Consequently the aerial wire was run up through the center of the main spar. This spar being hollow for the passage of ropes to the mast head, allows an ideal vertical antenna to be had.



Stromberg-Carlson radio installed in cabin of Walter Todd yacht

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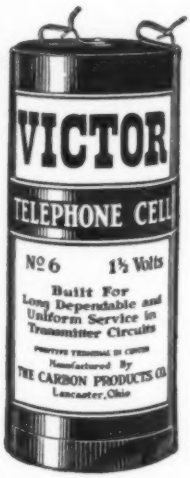
The contract for the erection of a $75,000 structure for the Northwestern Bell Telephone company at Fort Madison, Iowa, has been let to the John Soller Construction company of Davenport.

VICTOR TELEPHONE CELLS



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Locating Faults in Cable

Some Facts Not Generally Known Regarding the Testing of Cable for the Location of Faults

By CHRIS D. STEWART

Cable is coming into general use at an increasing rate and each year sees a larger percentage of the total wire milage in cables.

To keep these cables free from trouble is a big job which requires a knowledge of many details which are little known except to those who have made a study of this work.

Cable troubles consist mainly of shorts, crosses between pairs, grounds, and dampness or wet spots.

At first all cable trouble was located with measuring instruments. However, it is impossible to measure and tell just where to cut into a cable to clear trouble in cables over 500 feet long and it takes an expert tester to do it in cables of much shorter length.

Considering the above, it was only natural that some easier, surer and more simple method should be sought for.

The induction method was next tried and found to be more simple and for the average worker easier to understand.

By the induction method we mean putting a current out over a conductor and return by way of the fault and then intercepting the induction with an exploring coil.

Note Fig. 1. The current passes from post 1 of the Cable Tester out over the conductor and returns by way of the fault. This current is of such a nature as to cause a fluctuating field around the conductor. Now anytime the exploring coil is held to the cable anywhere between the instrument and the fault, a tone is heard.

This looked in theory as though the problem had been solved. However, it was found in practice that the tone in a number of cases carried by the fault and could be heard beyond the fault, thus giving a false location. This being true, more often when locating wet spots than when locating metallic grounds.

Note Fig. 2 and follow the arrows.

In this case the current passes from post 1 of the instrument out over the conductor and splits at the fault, some flowing back on the cable sheath and some ahead on the cable sheath out to a bond or bonds or other connection with the ground and back through the ground to the office ground and to the cable through a bond or other connection.

In this case with an ordinary exploring coil the tone would be heard beyond the fault. An insulating joint in the cable sheath or a loop box or other opening in the cable sheath between the fault and the instrument would make this trouble impossible to locate.

The next step was to make an exploring coil that would not pick up the tone on the sheath and would pick up the tone on the wire under test.

This was done by putting a fish tale or "V" shape pole face on the exploring coil so that when the coil was held to the cable sheath, the center of the coil was always over the center of the cable regardless of the size of the cable. Note Fig. 3. The large cable is represented by the large circle and the small cable by the small one. In either case the lines of force set up by current on the sheath or armor, cut one-half the coil as much as the other and no current is generated in the coil. However, as no conductor goes exactly in the center of the cable due to the twist and spiral used in the make-up of cable, the field set up by the conductor would cut one side of the coil more than the other, thus generating a current and setting up a tone in the receiver.

The fish tail pole face on this exploring coil is a patented feature.

It was found that even when using the patented coil in a number of cases especially on wet spots, that tone could sometimes be heard beyond the fault and it was discovered that the current escaped to the messenger by means of metal rings, clips and other connections and gave false tests.

To eliminate this, the coil was held directly under the cable. Note Fig. 4.

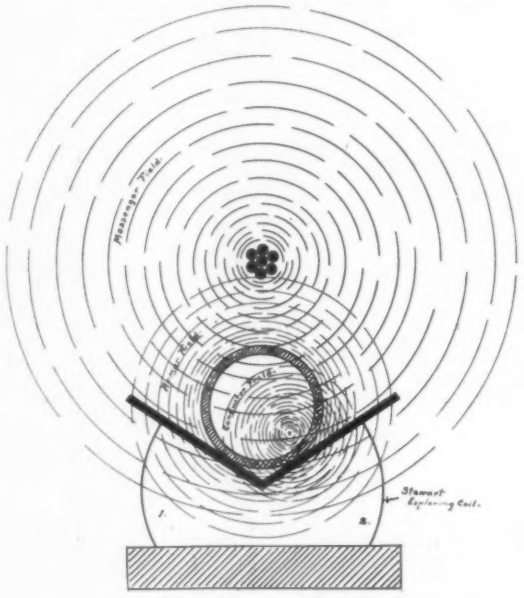

Fig. 4

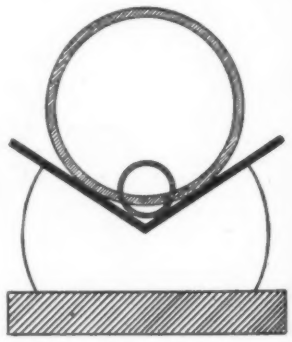

Fig. 3

Now we have neutralized the tone on the sheath and the messenger as each cut the coil in a neutral plane. Note, however, that the field

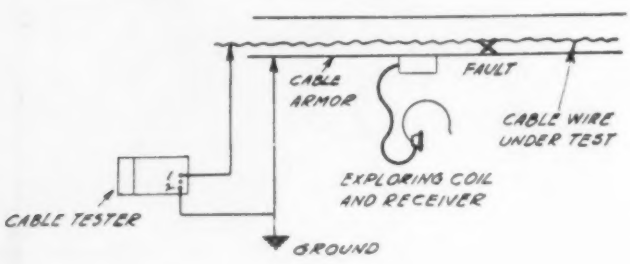

Fig. 1

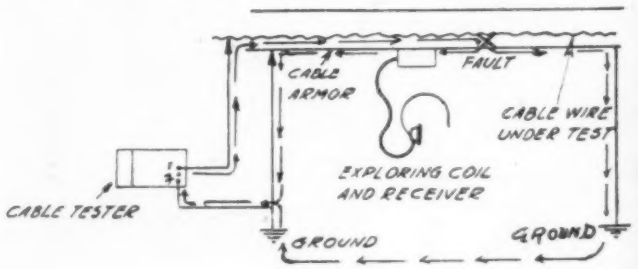

Fig. 2

set up around the conductor cuts one side of the coil more than other, thus setting up a tone.

The only thing left to cause the tone to go by is the capacity of the wire under test. It can readily be seen that this would have no effect only in cases of high resistance trouble.

To offset this carry-by, the sender is so arranged as to cause a large voltage drop at the fault even though the resisttance of the fault is high.

In cases of very high resistance it is advisable to try from both ends of the cable where possible.

A new method of locating wet spots with the apparatus having the above features is outlined in the following:

A study of water trouble in cables showed that the battery flowing out over conductor and through the water lowered the resistance of the fault.

The usual procedure has been to disconnect the pair from the switchboard apparatus and connect the Cable Tester. As soon as this was done the battery would stop flowing through the water and the resistance of the fault would start at once to increase until in a short time it would be too high to locate.

Therefore, if the current can be kept flowing while the Cable Tester is connected, the resistance of the trouble will be kept low and will be more easily located.

This can be done by making the connections as shown in Fig. 5.

The voltage of the battery should be between 24 and 30 volts. The choke coil may have any resistance as long as it will choke the Cable Tester current so that it will not flow back into the battery. A ringer coil or relay coil will be O. K. for this purpose.

If the Cable Tester is not a "STEWART" it should have a high non-inductive resistance in series with the trouble and connected between "A" and the sender. This to keep from shorting the batteries.

(*Continued on page 42*)

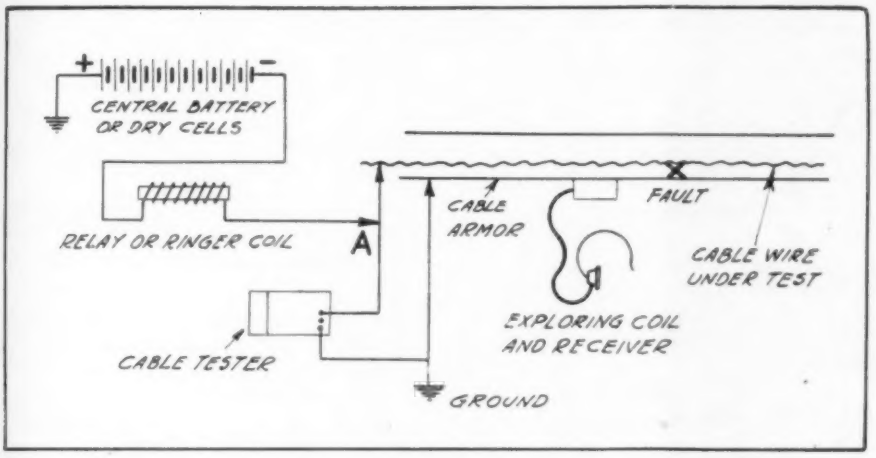

Fig. 5

Fig. 6

THE "STEWART" CABLE TESTER

will save its cost clearing the first case of trouble.

The patented exploring coil makes its use simple so that any telephone man can use it. It does not take a cable expert.

Having two vibrators connected to a two-point switch, makes it more reliable in getting away from disturbing noises.

Will not noise up the working pairs when locating wet spots.

The only Cable Tester of this type that is reliable for locating wet spots and moisture is the most troublesome of all cable faults.

The patented exploring coil will no doubt make your old Cable Tester more efficient.

Also, lineman's Test Sets, that tell which way and how far trouble is from tester without opening the line, Direct Reading Test Cabinets, and Detecto-Meters.

STEWART BROTHERS

OTTAWA, ILL.

Sent on Trial

Ramblings

By J. A. S.

H. B. Gash is a very progressive telephone operator over at Avon, Illinois. His nest egg hatched and the brood has increased until he is "sitting pretty" is what the street would say. But he had his struggles, and his wife with him, and it is interesting to hear him explain some of his experiences. Says he, "You're the Engineer man, are you?" We modestly admitted as much. "Well," he continued, "you have lots of good articles in your publication—(he did not mean his contribution to the October number)—and I wish more linemen would tell their experiences than they do; and others, too, for that matter." What kind? we asked. "Well, while working in Colorado, one of the boys was called to repair a phone on a farm line. When the work was completed the farmer asked the repairman what the trouble was. 'Oh, only a fuse blown out last night.' The farmer comes right back and says 'I was telling "Sary" last night that the wind was blowing something awful, but did not think it would blow the fuses out of a telephone.'"

* * *

L. W. Scherer, president of the Oklahoma Utilities Association, and general manager of the United Telephone Corporation with headquarters at Watonga, Oklahoma, was a visitor to the Missouri convention at Kansas City November 13, and came to Chicago on the 14th to transact business here. Mr. Scherer reports considerable construction in his section; he stated his company had erected some twenty miles of toll lines this year. Some of the properties taken over by Mr. Scherer's company were in very bad condition, and he reports that it will take another year to bring them up to a standard that will enable them to give the service they desire.

* * *

Houck McHenry and R. W. Hedrick, president and secretary, respectively, of the Missouri Telephone Association came to Chicago, took in the banquet and entertainment, and resolved straightway to put on a show that would surpass Chicago and all others for years to come. How they succeeded financially we do not know. But the aggregation of pretty talent displayed at the Missouri convention at Kansas City would put to envy the beauty contests at Atlantic City annually. How they did it, we do not know. But the entertaining features were commented on by those who attended as unusual. Order your banquet tickets now for the next annual Missouri convention, boys, for if it beats this year's, there will be a shortage of pasteboards.

TELEPHONE ENGINEER acknowledges receipt of an invitation by the United States Government to attend a general conference held in Washington, for the purpose of considering a simplification of pocket knives. This is probably the work of the Pine Box Whittlers' Club, so prevalent throughout the South. There has always been a rivalry between the professional and the amateur whittler as to the best sizes in pocket knives, and now the government steps in and plans to decide for them. The Republican party has decreed that the farmer is entitled to legislation, and we want to say right here that the whittler and the dirt farmer is in no way connected and that if they think that by throwing out this sop to the South they can appease the latter they are off their nut. And we want to also state that when the government undertakes to regulate the size of dice our application for crap inspector will be filed.

* * *

The Suttle Equipment company had exhibits at both the Illinois and Missouri conventions. This concern has been making almost phenomenal strides in the upbuilding of a sales organization the past year or two. Under the guidance of S. P. Hull, president, and J. F. Crankshaw, sales manager, its growth has increased several hundred per cent. New lines are now being carried and almost anything in the telephone line, either used or new, can be supplied from their warehouses at Lawrenceville, Ill. They issue a monthly price list bulletin of some fifty pages, listing items and giving prices. Their exhibits attracted considerable attention.

* * *

Shadows as well as sunshine fall upon us; fortunate indeed is he who can hold back the bitter tears of sorrow when tragedy stalks in. A. B. Chance, Sr., of Centralia, Mo., whose son was instantly killed November 18, while burdened with sorrow has that eternal faith in the herafter which sustains him in his present grief. Buford Chance was a great source of comfort to his father, whose hopes were built up around his two sons, and was an exemplary young executive with a bright future. And like other men who strive to live under the guidance of divine inspiration, Buford's father bears the burden as one who submits to the will of Him from whom we have learned that "man proposes, God disposes." The whole industry extends condolence to the Chance families.

* * *

Our old friend, J. H. Welker, who hails from the city of former President McKinley, sent us recently a box of anti-Jewish necessities from certain sections of the swine family. While not exactly a "hot dog" it was about the hottest package of parcel post we have received in many days. E. C. Lewis, pioneer telephone salesman, and who poses as a farm expert, especially that part which pertains to the culinary art on the farm was called in and after sampling generously of the repast, was asked if it was not fine; "fine H—l," he says: "it's perfect."

* * *

B. Y. Chambers has been made assistant manager of the Central Ohio Telephone Corporation, with headquarters at Mt. Gilead, Ohio. Chambers is a product of the sunny south. Back in 1912-15 he was with the Central Home Telephone Co. at Providence, Ky., where we first made his acquaintance. The passing of that concern into other hands made necessary the removal of Mr. Chambers, and we again find him moving north. The writer believes in Chambers and congratulates the Ohio Central.

* * *

Evidently the people of Cookeville, Tenn., think a great deal of S. Hayden Young, who has served as secretary of the Gainesboro Telephone Company for twenty-eight years. He was tendered a banquet and presented with a token of esteem by the employes and the town in general. "Such recognition must be deserved." We'd like to shake the hand of Mr. Young. If, after serving the people as secretary of a telephone company that long he still has their good will, he must be a dandy good fellow.

Locating Faults in Cable

(*Continued from page* 40)

This method of connection will keep battery flowing through the trouble and keep the resistance low, and the trouble more easily located.

Fig. 6 shows cut of a complete instrument having all the features mentioned in the above article.

In the near future the writer will give a complete explanation of the application of the above Cable Tester in locating faults in cable buried in the ground.

The location of this trouble cannot be accomplished without the use of a good cable tester.

As considerable cable has been installed in this way any company having cable buried in the ground may get a helpful idea or two by watching for the article.

Anyone desiring further information in regard to the complete instrument or the patented exploring Coil, may obtain same by writing Stewart Brothers, Ottawa, Ill.

The city of Denver the other day installed its 85,000th telephone.

On January 1, 1928, the Dominion of Canada had 1,265,869 telephones.

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CHANCE MAKE BETTER ANCHORS POLE LINES
A Type and Size To Meet Every Need
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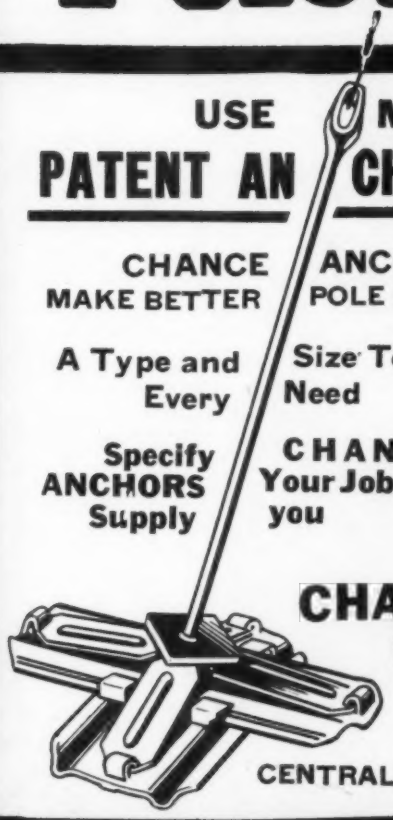

CHANCE CO.
CENTRALIA, MO.

INSURE YOUR OVERHEAD LINES
BY SPECIFYING
NORTHERN or WESTERN
CEDAR POLES
PLAIN or BUTT-TREATED
FROM
MacGillis & Gibbs Co.
120 E. Wisconsin Avenue,
Milwaukee, Wisconsin

REPUBLIC POLES
Northern and Western Cedar
Butt-Treating
REPUBLIC CEDAR CO., Marinette, Wisconsin

Advertisers on this page are noted for their reliability. Buy from them with confidence.

Troy, Ohio, Acts as Host to District Telephone Convention

Over in Ohio is to be found some of the best telephone men in the country; and where you find good telephone men you find good telephone exchanges. They go hand in hand.

* * *

November 3rd J. Warren Safford of the Troy, Ohio, Telephone Company was host to the third district conference of the Ohio Telephone Independent Association. When we speak of Safford we mean also his efficient group of employees, without which he could not give the excellent service he is reported to be giving.

* * *

We have always envied the people of Ohio; they seem to have everything plus. From the train window and from the highways we have noted the pleasant surroundings of the inhabitants of this state. In the telephone business here the slogan: "Building for the Future" is exemplified. Especially is this so in Troy.

* * *

At this district meeting some eighty members and guests registered and were entertained by the Troy Telephone Company at a luncheon at the Troy Country club prior to the meeting in the afternoon.

Coleman Allen, secretary of the Troy Telephone Company, welcomed the guests to Troy on behalf of his company, and Mayor Stokes extended a further welcome on behalf of the city, pointing out its many industries, etc. E. G. Miller of Warren, Ohio, responded on behalf of the association.

* * *

J. Warren Safford, president of the Ohio Independent Telephone Association, and president of the Troy Telephone Company, gave an outline of the activities of the state association and the needs of the telephone industry in his state. He stressed the questions of rights on highways and legislative questions. He covered many questions of interest to the industry, and discussions followed which prolonged the session until well in the afternoon.

* * *

During the day the members and guests took advantage of the invitation to inspect the telephone plant and were delighted with the progress shown by this company. Mr. Safford and his staff were the recipients of many words of commendation.

Simplex Pipe Pushing Jacks Prove Effective

Pushing water or gas pipe, or pipe for electrical service or for oil heating supply, under paved streets or alleys, or under gardens or lawns, irrespective of temperature conditions, is a practical and modern development.

The pipe is gripped by jaws in the center of the jack illustrated, and one or two men operating each of the two levers, cause the pipe to be pushed through the ground powerfully and accurately.

Pushing pipe underground mechanically

These Simplex Jacks are built in two sizes—the No. 332 for pushing pipe of ¼ in. to 2 ins. in diameter—and the No. 334 for pushing pipe of 2 ins. to 4 ins. in diameter—a feature being that each size of pipe requires a set of jaws to conform to the size of pipe, and by which the crushing or distorting of the pipe is avoided.

Laboratory and practical service tests have governed every detail of construction and operation, and the materials used and their design are co-ordinated for the single purpose of producing service and longevity, and which has made necessary the liberal use of alloy steels and their heat treatment and hardening.

The average time required to push a 3 in. pipe through 25 ins. of solid soil is between 5 and 6 minutes, using two men on each of the 2 levers—or approximately 23 man minutes, which time also includes resetting the pushing or traveling portion of the jack.

View of the No. 334 Simplex in operation pushing a section of 3 in. pipe

Bulletins descriptive, or moving picture reels illustrative of the Simplex Pipe Pushing Jacks in action, may be obtained from Messrs. Templeton, Kenly & Co., Ltd., Chicago, who are the sole manufacturers of the Simplex Jacks, or from the 66 branch offices of the Graybar Electric Company, Inc.

For foreign service, descriptive bulletins in several languages may be obtained from the International Standard Electric Corporation, 67 Broad Street, New York, the Baldwin Locomotive Works at Philadelphia, or the Equipment and Engineering Co., Ltd., in London—and, in Canada, from the Northern Electric Co., Ltd.

The opening for this Pipe Pushing Jack was limited to the space between the sidewalk and the curbing, viz., 5 feet (a common condition), yet the Simplex Pipe Pushing Jack was operated without any difficulty and at a great saving over tearing up the street.

Fully Guaranteed

Size: 12″ x 9″ x 5″

ONE REED!
ONE CONTACT!

TELERING

THE SUPER FREQUENCY CHANGER

For All Telephone Ringing Purposes in Any Capacity from a P. B. X. to the Largest Central Office

Directly Converts 60 Cycle Lighting Current to 20 Cycle Ringing Current

DOES NOT INTERFERE WITH RADIO RECEPTION

Simple	Will Not Puncture Cable Insulation
Low First Cost	Will Not Break Down Key Insulation
Self-Starting	Keeps Ringing Leads Out of Cables
Self-Contained	Eliminates C. O. Distributing Equipment
Ideal Wave Form	for P. B. X. Ringing
Negligible Upkeep	Short-Circuiting Is Harmless
No Parts to Renew	Will Not "Noise" Cables

FIRST COST IS PRACTICALLY THE ONLY COST
INSTALL IT—THEN FORGET IT
IT PAYS FOR ITSELF

Price $40.00 Complete
F. O. B. Elyria
Sold by the Leading Supply Houses

Manufactured by

THE COLSON COMPANY

Elyria, Ohio

Established 1885

"REBUILT" TELEPHONE APPARATUS and exchange equipment saves you 30 to 50 per cent without sacrificing quality or efficiency.

SWITCHBOARDS—Telephones—Apparatus—Protection Equipment—Cable—Everything you need for the installation and operation of a complete exchange—Magneto or Central Energy—of the best and most reputable manufacturers.

Fourteen years' successful operation of our rebuilt equipment department puts it past the experimental stage. Quality and price will make you a permanent customer. Better investigate.

BARGAIN BULLETIN NO. 78 FREE

Address "REBUILT" EQUIPMENT DEPARTMENT
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BOWDLE

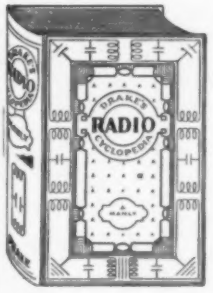
"Know where you stand"

Investigate Our Centralized Accounting Plan

This monthly Audit will save you lots of money and give you important information that you should have about your business—the best of all business, if properly managed.

BOWDLE ACCOUNTING SYSTEM

CERRO GORDO ILLINOIS



DRAKE'S RADIO CYCLOPEDIA
By HAROLD P. MANLY

A Complete and Non-technical Reference Work, covering nearly 1700 subjects arranged alphabetically, including instructions for building, operating and testing receivers, power units and radiophone equipment. Arranged for use by set builders and designers, service and repair men, dealers and salesmen, experimenters and students, set owners and operators. 871 Pages. Size 6x9". 985 Illustrations, Circuit Diagrams, Constructional Layouts and Graphic Curves. All made especially for this book. Bound in Art Buckram. Stamped in Two Colors. Price $6.00

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236 N. Clark St., Chicago, Ill.

SUPERIOR
Black and Gray Friction
Highest in Quality

TAPES
Black and Gray Rubber
Meet All Specifications

No. 6 STORM KING
Telephone Batteries

LINE HARDWARE
HOT GALVANIZED

American Steel & Wire Co.'s Perfected Extra Galvanized
B B. Iron Wire and Steel Strands
Fir Cross Arms—Pins—Brackets—Cedar Poles
Bare and Insulated Copper and Iron Wires

A. J. JOHNSON ELECTRIC COMPANY
TELEPHONE SUPPLIES
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Safest—
Soundest—
Most Profitable
to specify and buy

STANDARD
TELEPHONE CABLES

STANDARD UNDERGROUND CABLE CO.
Division of General Cable Corporation
PITTSBURGH, PA.

LINE AND DESK

MORE ABOUT STORING POLES

In connection with discussion of keeping poles free from decay while in storage which has been carried on in our last two numbers, we have the following letter from Mr. J. P. Wentling, director of research of the Western Red Cedar Association:

"On page 38 of your October issue I notice that some users of cedar poles are calling for help. In case they are still in need of assistance I want to suggest that you pass on to them the following information.

Every pole yard should be kept perfectly clear and clean of all scrap wood, whether decayed or not; all poles placed on skids that have been thoroughly painted with hot creosote, the skids supported on concrete pillars at least two feet high—three feet is better. Old railroad rails are preferable to wooden skids. In case poles are piled for any length of time they should be separated by "two by four" or "four by four" stickers that have been painted with hot creosote. The idea is to keep cedar poles free from each other as much as possible and sufficiently high from the ground to allow free circulation of air around each pole.

Decay is caused by a fungus disease and may be transmitted from pole to pole or poles may become infected from rotten timber lying around in the storage yard."

30 YEARS CREOSOTED POLE EXPERIENCE

Some thirty-one years ago, on October 4, 1897, to be exact, the A. T. and T. Company issued invitations to the opening ceremonies of its new Washington-Norfolk line. Those in attendance at the gathering, in addition to marveling at long distance telephony, were likewise interested in the experimental features of the line. About 10,000 of the poles and guy stubs had been creosoted to reduce the possibilities of deterioration. This practice was an innovation, as was the fact that most of the poles were sawed square. Further, creosoted cross-arms were employed for the first time in this line.

Since this work was a departure from the usual, a representative of the A. T. and T. Company followed each stage of the work to make sure that specifications were scrupulously followed. The creosote was continually examined for quality, while oil and pole breaking tests were periodically made.

The poles being creosoted were of a variety now rather scarce—the strong longleaf pine, which has thin sapwood and a large percentage of heartwood. Since square sawing eliminated most of the sapwood, timber of the greatest strength for its size was left for use. The poles were then treated with creosote by the full-cell process. This treatment required an absorption of not less than 12 pounds of dead oil of coal tar per cubic foot of timber.

At the time of construction it was planned to place only six cross-arms on the poles. Later, due to the growth of telephone business in the South, this figure has been increased in some cases. Still further growth has led to the use of cable in the sections north of Petersburg, Va., and that will permit reducing the load in that section.

Since the inauguration of the Washington-Norfolk line, representative sections of the line have been inspected several times to determine whether the condition of the poles warrants general replacement. Such an examination took place in 1903 but only the slightest impairment was found. In 1908 he first regular maintenance inspection of the line was made, but only a few poles were removed on account of decay.

Additional inspections were made in 1914, 1919, 1923 and 1925. The latest was undertaken during 1927. This inspection disclosed that a large percentage of the poles have retained their original dimensions and that the wood fibre is still firm and sound after some thirty years of exposure to the weather. Except for a loss of part of the preservative, which tends to drain from the top to the bottom of the pole, they are in practically the same condition as when placed. A few of the poles have decayed at the top where, in the original construction, it was necessary to cut off a section of the top in grading the line, thus exposing some of the untreated portion in the center.

Long Lines Department has made a detailed study of groups of these poles in typical sections of the line in order to keep a record of their durability and of changes in their condition. In 1914, for example, some 1,600 poles were given a thorough study. A second inspection of the test sections was completed in 1923, but resistance to decay was still marked.

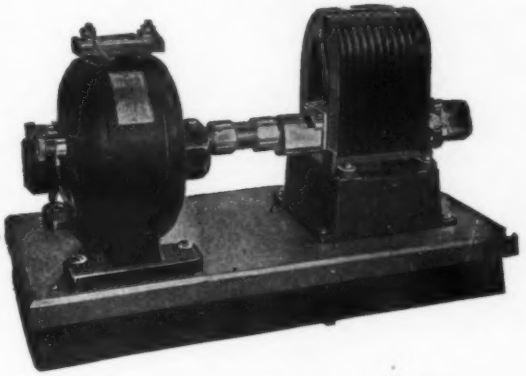
A pole-to-pole inspection, beginning at Norfolk and extending westwards towards Petersburg, was made in 1927. A large number of changes due to highway construction were found necessary. It is interesting to note, however, that in nearly all cases the poles removed to make room for the new roads were found to be in sufficiently good condition to warrant re-use at other points. Because of the small amount of deterioration discovered, it was not felt necessary to make an inspection of other poles.

Since 1923, the department has twice considered making a pole-to-pole inspection of the entire line. But the results of trial inspections made on short sections have indicated that in general, not enough dterioration has occurred to justify such an undertaking. Thus, after thirty years of life, the line is still in excellent condition. And, to judge by the present state of most of the poles, they should average at least another ten years of usefulness. — *Long Lines*, October, 1928.

HOLTZER-CABOT

Magneto - Ringing - Motor - Generators

ALWAYS DEPENDABLE



These units effectively replace all old-fashioned hand and battery ringing methods. Extreme simplicity of operation and low cost offer advantages over all other devices.

Cuts operating expenses by eliminating expensive and troublesome battery equipment.

Make possible a swift, sure, carefree service that pleases both subscriber and operating company as well.

Can be supplied for any voltage or special current. A thorough test will convince you.

Complete data and specifications on request.

HOLTZER-CABOT ELECTRIC CO.

125 Amory Street, Boston, Mass.

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***Crapo* Galvanized Products**

Telephone and Telegraph Wire

Steel Strand

A sleet storm.... Miles of line down.... Wire stocks inadequate .... Rush shipments imperative.... Then look to Jobbers of *Crapo* Galvanized Wire and Strand.... You can depend upon them in every emergency.... and they, in turn, can depend upon us.... for they know from experience that RUSH orders received by us in the morning are shipped before night....

Indiana Steel and Wire Company

Muncie, Indiana. U.S.A.

The right flame for any installation work

Prest-O-Lite equipment offers a wide variety of flames. From a wide brush flame for general soldering and heating to a small sharply defined flame for making delicate connections.

There is a Prest-O-Lite Torch for every brazing, soldering or heating purpose. Telephone companies everywhere use Prest-O-Lite equipment for lineman's work and in the shop as well. Most of the larger utilities have standardized on Prest-O-Lite.

Ask the Prest-O-Lite distributor about this equipment or write us direct for complete information.

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Indiana Telephone Men Hold One Day Meeting at Fort Wayne

Approximately two hundred and twenty persons were in attendance at the annual one-day convention of the Northeastern Indiana Telephone association, held November 22, at the chamber of commerce. Seventy-five telephone exchanges were represented at the gathering, which included not only officials but also operators.

The Northeastern Indiana Telephone association is part of the Indiana Telephone association and includes exchanges in Lagrange, Steuben, Noble, DeKalb, Whitley, Allen, Huntington, Wells, Adams, Grant, Blackford and Jay counties.

A joint session of both executives and operators was held in the forenoon at the chamber of commerce. The meeting was called to order by P. J. Maloney, president of the association.

Charles J. Steiss, civic secretary of the Fort Wayne chamber of commerce, in the absence of Frank Bohn, president and general manager of The Home Telephone & Telegraph Company, Fort Wayne, extended the welcome of the community to the visitors, outlining to them some of the civic aspects of Fort Wayne and its many industrial advantages.

Talks were given by Roscoe Pontius, auditor of the Rochester Telephone Company, Rochester, on the subject of, "Plant Accounting for the Small Exchange" and by Henry A. Barnhart, president of the Indiana Telephone association, on the subject, "Ad Libitum." Following was a demonstration of the prone pressure method of artificial respiration by L. A. Schwan, secretary of the Y. M. C. A., with F. X. Staub, President of the Fort Wayne Safety Council and Equipment Engineer for the Home Telephone and Telegraph Company.

At noon, luncheon was served at the chamber. Music was provided during the meal by the Home Telephone Athletic association orchestra.

In the afternoon the executives met at the chamber of commerce and the operators at the Anthony exchange of the Home Telephone and Telegraph Company.

At the executives' meeting, W. H. Beck, secretary-treasurer of the Indiana Telephone association, delivered an informal address given by William Neeb, collection supervisor of the Home Telephone and Telegraph Company, on the subject of "Centralized Revenue Accounting and Collecting." Frank Baker, operating engineer of the Home Telephone Company, then gave a talk on, "Centralized Maintenance and Installation." Following was a round-table discussion.

Miss Pauline Wolfe, traveling instructress for the Home Telephone & Telegraph Company, presided at the operators' meeting. Questions were asked and answers given on the general subject of "New Toll Operating Practice."

Dakota County Seat Now Has Telephone Service

Belle Fourche, S. D.—Special: Camp Crook and Buffalo, S. D., and Baker, Mont., long have been without connection with the outside world by telephone, but now are in direct communication with the rest of the world, according to E. V. Cooper, manager of the Lead-Deadwood branch.

In spite of the fact that Buffalo is the county seat of Harding county, it has been without telephone communication with the outside world until now.

F. A. Bowdle Is Recovering from Illness

F. A. Bowdle, of Cerro Gordo, Ill., manager of the Inter-County Telephone company, and also the Bowdle Accounting System, has been confined to his home for the past several weeks. He suffered an attack while attending the National convention, but was able to go home and has been in bed most of the time since that time. He is again able to be out but is very weak and will probably not take up active duties for some time. In the meantime, his efficient force is taking care of his work for him.

Standard Undeground Cable Co. Issues New Catalog

The Standard Underground Cable Co., Pittsburgh, Pa., has just issued its new "Junction Box Catalog," showing in detail the different types of junction boxes for all uses. Diagrams are shown, illustrating how the boxes are placed and the cable connections. This is a 76-page booklet and very replete with information. Yours is now ready for you by addressing the above named company.

Install New Exchange

Pataskala, O.—The Ohio Central Telephone Corporation, which recently purchased the stock of the Pataskala Farmers' Telephone Co., is installing a new switchboard in the Pataskala exchange, through which more than 600 telephones will be operated.

Automatic Cutover at New Haven, Indiana

On Thursday, November 15, at midnight, a new automatic telephone system for the New Haven Exchange of the Home Telephone and Telegraph Company was cut into service.

The cutover required only thirty-six seconds.

No single misfortune marred the cutover. When finally the Thursday evening traffic died and the manual board was free, the insulating strips were pulled from the automatic switches and the cables to the manual board were cut. Immediately the many New Haven subscribers, who apparently had been sitting up for just that reason, began to dial numbers and the automatic switches switched the calls through to completion.

Preparatory to the cutover every telephone in the New Haven area was changed, many of the subscribers taking handsets, new copper wire was strung on the rural lines, and new cables were installed in the town—all to bring the subscribers' equipment and the outside plant up to a standard comparable to that of the central office.

Highway Trailer Company Issues New Catalogue

The Highway Trailer Company, Edgerton, Wisconsin, has just issued a new catalogue describing the Highway Earth Boring equipment manufactured by that concern. The catalogue describes only the above units and shows operation with truck and tractor mounted, and is very instructive.

This catalogue should be in the files of those interested in labor saving devices and those who are doing construction work. It is yours for asking.

Write the Public Utilities Division of above Company for same.

An election has been called at Medford, Okla., for December 17, to vote on a proposed extension for 25 years of the franchise there held by the Medford Rural Telephone Company.

Millions of Everstick Anchors

are in satisfactory service. Do you not think this convincing?

Order Eversticks through your jobber.

EXPANDED

THE EVERSTICK ANCHOR CO.

Saint Louis, Missouri

YOUTH

Youth is not a time of life—it is a state of mind. It is not a matter of ripe cheeks, red lips and supple knees; it is a temper of the will, a quality of the imagination, a vigor of the emotions; it is a freshness of the deep springs of life.

Youth means a temperamental predominance of courage over timidity, of the appetite of adventure over love of ease. This often exists in a man of fifty more than in a boy of twenty.

Nobody grows old by merely living a number of years; people grow old only by deserting their ideals. Years wrinkle the skin, but to give up enthusiasm wrinkles the soul. Worry, doubt, self-distrust, fear and despair —these are the long, long years that bow the head and turn the growing spirit back to dust.

Whether seventy or sixteen, there is in every being's heart the love of wonder, the sweet amazement of the stars and the starlike things and thoughts, the undaunted challenge of events, the unfailing childlike appetite for what next, and the joy and the game of life.

You are as young as your faith, as old as your doubt; as young as your confidence, as old as your fear; as young as your hope, as old as your despair.

In the central place of your heart there is a wireless station; so long as it receives messages of beauty, hope, cheer, courage, grandeur and power from the earth, from men and from the Infinite, so long are you young.

When the wires are all down and all the central place of your heart is covered with the snows of pessimism and the ice of cynicism, then are you grown old indeed, and may God have mercy on your soul.

Findlay Phone System Normal

Findlay, O.—The Ohio Bell Telephone Co. has just completed repair work made necessary by the sleet storm of last spring. Findlay was hardest hit of any city in this section, telephone men said.

It was necessary to virtually rebuild rural lines out of the city.

"The Finlay system is practically new as a result of the storm," said Manager Charles Sucher.

Cost of the repair work was $130,000.

WANTED—Iowa man wants short time jobs repairing switchboards, etc. Reliable references. Geo. Bishton, Box 645, Cedar Rapids, Iowa.

100 Kellogg Common Battery indestructible desk stands and No. 259 steel signalling boxes with W. E. No. 20 induction coil in signalling set at $7.00. 200 W. E. No. 58 A Protectors at 60c. TELEPHONE ENGINEER, 192 N. Clark St., Chicago, Ill.

FOR SALE

10,000 Steel cross arm pins @ 6c each. 1 Kellogg 50 line magneto switchboard with 30 lines equipt @ $125.00. W. E. No. 14 C terminals, 16 pair, less stub @ $4.00. 3 inch strain insulators $4.00 per 100. Cook B7 protectors @ 40c.

TELEPHONE REPAIR SHOP
6966 Ravenswood Avenue
Chicago, Illinois

RECONSTRUCTED EQUIPMENT

Kellogg No. 37 1-M. F. Swbd. cord Ckt. condensers @	$ .35
Kellogg, Dean, Stromberg or Auto. Elec. 1-M. F. condensers @	.30
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Kellogg No. 742 C. B. Steel hotel sets with straight line or 16-33-50 or 66 cycle ringers, equipped with Ind. coil Booster Ckt. @	6.75
Western Elec. No. 1333 C. B. Steel hotel set with Straight line or 16-33-50 or 66 cycle ringers, equipped with Booster Ind. and W. E. Trans. & Rec. @	6.75
Kellogg Latest type ringing and Listening Keys with ring back attachment @	2.25
Reliable Elec. 5 amp. fuses, fit Cook No. 7 Arresters, per hundred @	3.25
Kellogg No. 41 Receivers, complete with cord and re-polished shells @	1.35
Western Elec. No. 143 receivers with cord and repolished shells @	1.25
Western Elec. No. 229 or 250 transmitters with mouthpiece & back @	1.15
Western Elec. No. 329 or 323 transmitters with mouthpiece & back @	1.35
North Elec. 4-bar Bdg. hand Generators complete with crank & mounting screws @ $1.50—5-bar @	1.75
H. C. Ringing machine, motor 110 volt D. C. Generator delivers 80 volts, 20 cycle ringing current—practically new @	50.00
Kellogg or Stromberg 1000 ohm self contained ringers complete less gongs @	1.25
Kellogg No. 97 C. B. desk sets complete with No. 75 Straight line Steel signal sets @	6.75

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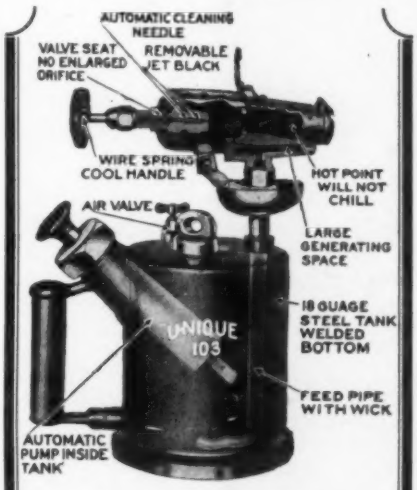

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UNIQUE

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Unique torches supply the means to efficient workmanship. Storm has no effect on Uniques. An automatic orifice cleaner permits no clogging.

Write today for catalog that describes in detail their many features

UNIQUE MFG. CO., Inc.
221 W. WHITING STREET
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PEARL LIFE-TIME DROP WIRE BRACKETS

Save time, labor and waste. Hot-galvanized screw-hooks and malleable castings are separable and indestructible. Standard 2 groove porcelain. Stocked by telephone manufacturers.

WM. H. PEARL CO., Indianapolis

Send for free sample and prices on

UNIVERSAL DROP WIRE INSULATORS

Universal Specialty Company
711 Poplar St., Terre Haute, Ind.

Get your
Telephone Repair Work
done at the old reliable
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SUTTLE EQUIPMENT CO.
LAWRENCEVILLE, ILL.

TRAVELERS select the Great Northern for its wonderful location in Chicago's "loop". They return because the large comfortable rooms, homelike environment, attentive service, excellent food and moderate charges make it an ideal hotel.

400 Newly Furnished Rooms
$2.50 a day and up

Sample Rooms
$4.00, $5.00, $6.00
$7.00 and $8.00

WALTER CRAIGHEAD
Manager

Dearborn St. from Jackson to Quincy
New Garage One-Half Block

SCRAP PLATINUM

Highest prices paid for discarded or obsolete telephone and switchboard apparatus; platinum contact relays, ring keys, etc. Have specialized in this field for many years.

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Write for Particulars
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DIRECTORY ADVERTISING EXCLUSIVELY

J. G. WRAY & CO.
Telephone Engineers
Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization and Operation of Telephone Companies.
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J.K. Johnston, Telephone Engineer
During recent years I have been privileged to appraise Telephone Exchanges all over the United States. The list totals $63. Would you like to avail yourself of my services?
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613 Merchants Bank Bldg. Indianapolis, Ind.
Special attention given to all matters pertaining to Valuations and Investigation of Public Utility Properties.
Formerly Chief Engineer, Public Service Commission of Indiana

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Specialization on Public Utility Accounting Records and Audits enables us to best serve Telephone Companies.
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Certified Public Accountants
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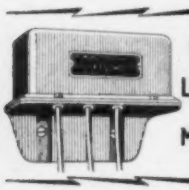
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LIGHTNING ARRESTERS
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MINNESOTA ELECTRIC CO.
MINNEAPOLIS, MINN.

Phone Adams 5646
Snook, Martin & Co.
Consulting Engineers
40 WEST GAY STREET
COLUMBUS, O.
Make Use of Our Combined Century of Engineering Experience

Pierson with Bremer-Tully Mfg. Company

R. T. Pierson of New York City has been elected to a directorship on the board of the Bremer-Tully Manufacturing Co. of Chicago, makers of Bremer-Tully radio receivers. This is a part of the expansion plans of this company which have been under way during the past year, involving their recent removal into a new two-acre factory on Washington boulevard.

"We have been doubling or trebling our business practically every year for the last seven years," said John C. Tully, president of the company, "and feel that we are now on the threshold of a much greater expansion. We have never come near to filling our orders during the peak of the season during any of the seven years since broadcasting began. It has always been a firmly established policy of the company not to push production to the point where there was any chance of sacrificing the reputation for quality which B-T has enjoyed, and on which basis the success of the company has been established.

"I feel that Mr. Pierson's association with us will be of the greatest benefit not only in maintaining the position we have attained, but in developing further plans now under way to enlarge the scope of the business, and increase its effectiveness. I have in mind the fact that there are few men who possess such a wide knowledge and experience as Mr. Pierson. He is not only an engineer with commercial experience, but also a manufacturer with a thorough knowledge of distribution problems and skilled administrator. I have been looking forward for some time to the possibility of securing assistance in sharing the burdens of an increased business, and I believe we have found in Mr. Pierson the ideal combination."

Although widely known in the telephone industry through his early association with the Western Electric Company and later for seven years with Stromberg-Carlson, Mr. Pierson is best known in the radio field as president and treasurer of the Hazeltine Corporation, which positions he held for upwards of three years; and as chairman of the board of Independent Radio Manufacturers, Inc., which will be remembered as a group of fourteen manufacturers operating under the "Neutrodyne" patents.

Bremer-Tully have also announced the addition to their line of an electric radio-phonograph combination, manufactured under the recently acquired electric phonograph patents licenses from General Electric and Westinghouse. An eight-tube receiver is employed, together with a dynamic speaker, and an electrically driven phonograph motor.

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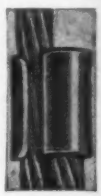
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S. C. and Kellogg jacks for above sets	.35

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Type 2—With Induction Coil in Base.
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Automatic Monophone Wall Set
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Automatic Monophone Desk Stand with Dial Blank*
* When ordering Monophones for transition service, refer to the code number of the corresponding automatic Monophone. The Monophone is also available in desk and wall styles for straight manual service.

Tomorrow's Vogue in Telephones

The Monophone

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The second is that the adoption of the Monophone brings immediate and direct profit because of the extra rental which subscribers gladly pay for its use.

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Monophones are ordinarily furnished in black bakelite, with metal parts having a black enamel finish. They are also available in a variety of colors, with metal parts finished in colored enamel or in gold or chromium plate. Complete details furnished upon application.

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The illustration shows International Poles seasoning at the Beaumont Plant. Note their uniformity in size and stacking, and how carefully they are stacked on creosoted skids.

2IC8

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